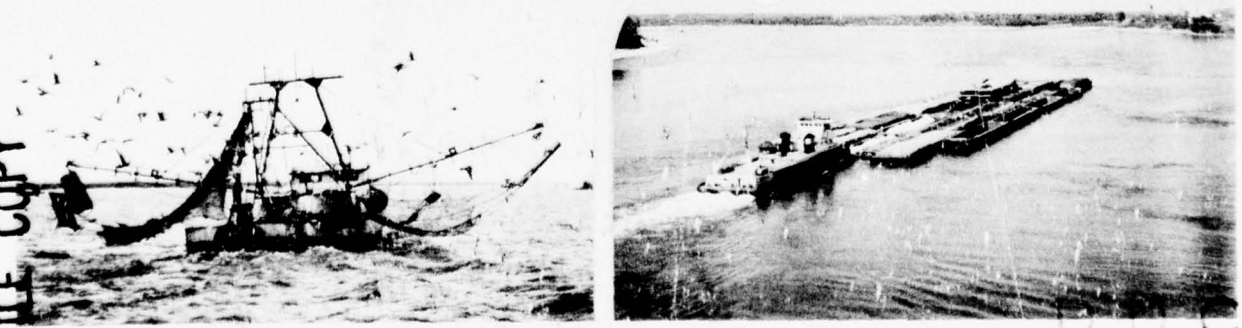
Lower Mississippi Region

Comprehensive Study



Appendix U
The Environment
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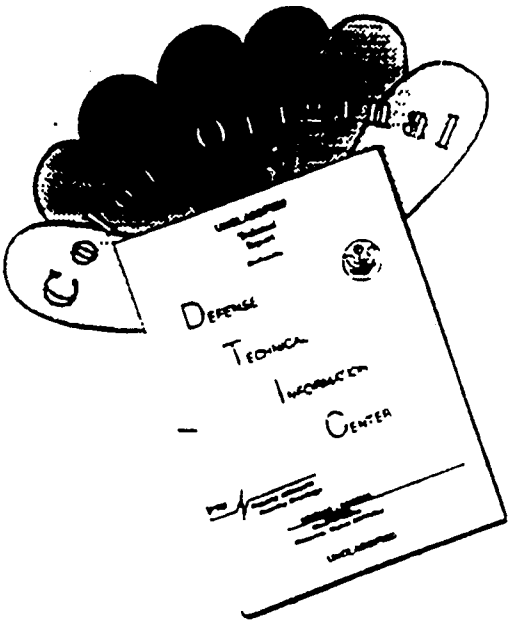

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This appendix is one of a series of 22 documents comprising the complete Lower Mississippi Region Comprehensive Study. A list of the documents is shown below.

Main Report

Appendixes

Appendix	Description	Appendix	Description
A	History of Study	K	M and I Water Supply
B	Economics	L	Water Quality and Pollution
C	Regional Climatology, Hydrology & Geology	M	Health Aspects
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THE ENVIRONMENT.

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LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY.

Appendix U.

PREPARED UNDER THE SUPERVISION OF
THE LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY
COORDINATING COMMITTEE

P R E F A C E

The current vogue for "environment" is not just a passing human whimsy to spruce up the world; it is the newest chapter in man's continuing search for himself. Never before have so many people been concerned with halting the degradation of land, air, and water; with improving the natural quality of living room on this planet; and with the agonizing choices of judgment of self-limitations that add up to shaping an environmental ethic.

For a variety of reasons, the search for a better world must begin with man himself. It is he, primarily, who has most altered the natural environment and it is he who will have to live with whatever else he makes of it. Essentially, then, what we pursue is a man-centered environmental ethic. Whether we call it that or a national policy for the environment or something yet unthought of makes little difference. From the President and from conference rooms of National and State legislative bodies to the backyards of concerned suburbanites, the search boils down to making the earth an attractive, meaningful habitat for man.

In today's modern dialogue and rhetoric, we repeatedly hear the word "environment." We hear discussion of the "environmental impact" of various activities and we see the Courts struggling to adjudicate environmental disputes. It would seem that a clear definition of the environment would emerge from so much discussion, but the word still has varied meanings in the minds of different people.

Within the context of the Lower Mississippi Region Comprehensive Study, environment is the sum of all factors that influence the growth and existence of an organism or a society (population of organisms), the condition or state of existence at any place as produced by all factors - natural and man-caused - of which man is both aware and unaware. In short, it is everything - everything that was here before man plus all the change man has wrought, both directly and indirectly. Not to be overlooked, it includes man himself.

Obviously, then, there are two distinct but largely inseparable components of the environment: (1) natural, and (2) man-made. The natural component consists of the outdoors devoid of man; land forms, water bodies, forests, and open areas subject to alteration only by geologic, hydrologic, and biologic processes; the land as it exists today and how it will appear in the future without further alteration by man. Included in this component are scenic rivers and streams; lakes; wilderness areas; wetlands; unique geological, botanical, and ecological systems; and other features of the natural environment.

Then, there is the man-made component. Within it are man's cities and suburbs, factories, farmlands and pastures, parks, campsites, reservoirs, canals, and all the associated paraphernalia representative of his livelihood and leisure. There are also his sundry forms of wastes, which he deposits upon the land or into the air or water. Further, there is man's physical and technological capability to alter his environment, and his freedom of choice to preserve and enhance the quality of that environment, or to degrade it, more or less as he alone sees fit.

Because of his wide freedom of choice in the past, man more often than not has elected to satisfy his economic and social demands without conscious forethought or perhaps without fully considering the impact of his actions upon the natural environment. This approach was widely accepted in bygone days when the available supply of water and related land resources was more than adequate for satisfactory fulfillment of most demands. No longer is this the case. Many resources, due to rapidly expanding and often competing uses, are dwindling; solutions to problems can and are creating additional problems.

Reservoirs, for instance, can serve the purposes of water supply, flood protection, power production, outdoor recreation, and others; but their development concurrently serves to reduce the available land base for tax collection, wildlife habitat, food and fiber production, or other purposes. Reservoirs can also reduce portions of free-flowing streams to slack water pools unsuitable for the life support of some species of fish, crustacean, and other invertebrates found in natural streams. Land clearing can provide timber for sawmills and open land for crops, livestock and poultry production, and municipal and industrial development. However, land clearing can also create sediment and erosion problems, destroy wildlife habitat, and eliminate areas of natural scenic beauty. Pesticides and herbicides can help to increase crop production, but add to pollution problems. Similarly, stimulated economic growth can add to society's wealth while subtracting from its well-being through the induction of air, noise, land, and water pollution.

Recognition of such problems has contributed not only to society's increasing environmental awareness, but also to its shifting value judgments about certain components of the natural environment. Rivers substantially undeveloped or underdeveloped, once largely ignored, are now valued as wild or scenic streams and are being "locked up" in order to preserve their intrinsic values. Tracts of land heretofore considered unsuitable for development are now valued as "wilderness areas" to be maintained intact. Certain species of plant and animal life dangerously close to extinction, or threatened thereby, are valued for their rarity, if for no other reason. Too, urbanites in ever-increasing numbers are filling their leisure hours by flocking to beaches and shores, lakes, scenic attractions, and to open and green space within the inner cities in search of variety and diversity to fulfill their

varied spiritual, psychological, and recreational needs. Thus, human demands and needs are expanding with no end in sight, while the natural resources available for needs satisfaction are finite, and in many cases nonrenewable.

In this situation, needs arising from the diverse demands must be met on a priority basis, necessitating compromises or so-called "trade-offs" as they are known in the jargon of resource planners. These trade-offs in the future will no doubt involve a greater commitment of human and natural resources to preservation and enhancement of environmental quality. But before any meaningful trade-offs can be made, it is necessary to have explicit knowledge of the environmental attributes and some idea of the magnitude of the environmental needs of a given region. It is for this reason that the task of identifying, evaluating, and locating environmental attributes of the Lower Mississippi Region was undertaken, and environmental needs were quantified. Hopefully, the exercise was worthwhile, and the information provided will be helpful in future planning for the conservation, development, and use of the region's water and related land resources.

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INTRODUCTION

The December 21, 1971, issue of the Federal Register gave notice of a period of public review and comment on the Water Resources Council's "Proposed Principles and Standards for Planning Water and Related Land Resources." Pursuant to the Water Resources Planning Act of 1965 (Public Law 89-80), the proposed Principles provide the basis for Federal participation with river basin commissions, States, and others in the preparation, formulation, evaluation, review, revision, and transmittal to the Congress of plans for States, regions, and river basins, and for planning of Federal and federally assisted water and land resources programs and projects and Federal licensing activities as listed in the Standards by the Water Resources Council.

To comply with the proposed Principles and Standards, plans for the use of the Nation's water and land resources must be directed to improvement in the quality of life through contributions to the objectives of national economic development, regional development, and environmental quality, of which the latter objective was defined by the Council as follows:

> "To enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems."

This objective within the context of the proposed Standards reflects "society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations." Therefore, the Standards provide that:

> "Explicit recognition should be given to the desirability of diverting a portion of the Nation's resources from production of more conventional market-oriented goods and services in order to accomplish environmental objectives . . .
>
> "Responsive to the varied spiritual, psychological, recreational, and material needs, the environmental objective reflects man's abiding concern with the quality of the natural physical-biological system in which all life is sustained. However, to the extent that man's environmental concerns are expressed in terms of population dispersion, urban-rural balance, urban congestion, and the like, these aspects are contained in the regional development objective.
>
> "Components of the environmental objective include the following:

(a) Management, protection, enhancement, or creation of areas of natural beauty and human enjoyment such as open and green space, wild and scenic rivers, lakes, beaches, shores, mountain and wilderness areas, and estuaries;

(b) Management, preservation, or enhancement of especially valuable or outstanding archeological, historical, biological (including fish and wildlife habitat), and geological resources and ecological systems;

(c) Enhancement of quality aspects of water, land and air by control of pollution or prevention of erosion and restoration of eroded areas embracing the need to harmonize land use objectives in terms of productivity for economic use and development with conservation of the resources;

(d) Avoiding irreversible commitments of resources to future uses . . . in order to minimize or preclude the possibility of undesirable and possible irreversible changes in the natural environment . . ."

The proposed Principles and Standards, though not followed entirely, have been adopted as the general planning basis for the Lower Mississippi Region Comprehensive Study. Accordingly, plans and programs derived from the study must emphasize each of the objectives without neglecting the others. The degree to which proper emphasis can be placed upon the environmental quality objective depends in large measure upon the degree to which plan formulators and decisionmakers can be apprised of resource needs associated with the various components of this objective. Hence, the planning process must include the explicit identification, evaluation, and accommodation of each recognized environmental quality component of the region.

PURPOSE AND SCOPE

The purpose of Appendix U, The Environment, is to summarize the results of coordinated Federal-State efforts to objectively assess and quantify resource needs which reflect society's concern with the quality of certain specified components of the "natural physical-biological system" of the study area. The specified components are:

a. Open and Green Space - Essentially undeveloped natural areas maintained at strategic locations in urban centers so as to provide a landscape with diversity and improved aesthetic visual quality for people residing therein.

b. Scenic Rivers and Streams - Free-flowing waterways, with shorelines and/or adjacent greenbelts essentially undeveloped, possessing scenic, recreational, geological, fish and wildlife, historic, cultural, or other features of such value as to merit maintenance in a specified state.

c. Lakes - Water bodies whose clarity, color, scenic setting, aesthetic quality, or other characteristics are of such special value that they merit being maintained in a specified state.

d. Beaches and Shores - Attractive beaches, distinctive scenic shorelines, and adjacent areas of clear offshore water which provide positive aesthetic values and recreational enjoyment.

e. Wilderness Areas - Areas of natural splendor and/or scientific interest 5,000 or more acres in size that are designated for the purpose of preserving primeval conditions, as nearly as possible, for aesthetic enjoyment and for limited forms of recreation or other uses.

f. Wetlands - Undisturbed marshes, swamps, and overflow lands that have many inherent values and a variety of uses.

g. Unique Geological and Botanical Systems - Areas of outstanding geological or botanical significance which contribute to man's knowledge and appreciation of his physical and biological environment.

h. Unique Ecological Systems - Interdependent physical and biotic environments that function as a unit, possessing not only intrinsic value, but also contributing to the environment or the general quality of life in a variety of subtle ways.

i. Bottomland Hardwoods - Natural stands of timber that contribute significantly to the natural lowland ecological systems in which they develop.

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cont

Resource needs related to these components are herein expressed in terms of land and water areas needed by 1980 to satisfy the environmental quality objective, bearing in mind that similar needs expressions relative to other components of the environmental quality objective are adequately presented in other related appendixes.

RELATION TO OTHER APPENDIXES

The findings of the Lower Mississippi Region Comprehensive Study are embodied in a summary report and 21 appendixes, of which this appendix (Appendix U) and six others deal directly with previously mentioned components of the environmental quality objective. Appendix O, Coastal and Estuarine, addresses the question of needs for management, protection, and enhancement of estuaries. Similarly, needs for management, protection, and enhancement of archeological and historical resources are presented in Appendix P, Archeological and Historical Resources. Appendix Q, Fish and Wildlife, deals with such needs for biological resources, including fish and wildlife habitat. Needs for the enhancement of quality aspects of water by control of pollution are covered in Appendix L, Water Quality and Pollution; and needs for the enhancement of quality aspects of land by prevention of erosion and restoration of eroded areas are covered in Appendix S, Sediment and Erosion. Appendix T, Plan Formulation, includes details on a single-objective "environmental quality plan" for the region, taking into account the many environmental quality needs identified in the above appendixes.

Of the remaining 14 appendixes, one summarizes the history of the study, including activities associated with the development of data presented herein. Three provide basic data on resources available for supplying environmental quality and other identified needs; the other 10 provide functional data on resource problems and needs, including flood problems, land drainage, and others, whose solutions can impact directly upon the quality of the environment.

PRESENTATION OF MATERIAL

This appendix is presented in 14 sections. Section 2, describing the methodology supporting the environmental assessment, outlines the procedures for identifying and evaluating environmental quality resources and the means by which environmental needs were quantified.

The Lower Mississippi Region is viewed in historical perspective in the third section. This includes a brief view of the region prior to the advent of man, and a historical sketch of how the region has changed since then.

The fourth section presents a summary of the environmental situation in the region. The present status of significant natural environmental components is discussed, and future environmental quality component needs are presented. Similar information is presented in sections 5 through 14, except that the information therein, given in greater detail than previous sections, relates specifically to the 10 separate but contiguous water resource planning areas (WRPA's).

METHODOLOGY

GENERAL

Development of a rational, realistic methodology for assessing environmental problems and determining environmental needs proved to be a difficult undertaking in this study, due to the lack of firm guidelines or previously developed evaluation techniques. As a result, several months of work were expended in an effort to formulate a viable approach to the task.

Initially, attempts were made to develop general abstract appraisals of environmental conditions and problems in the individual WRPA's of the region; consequently, broad, nebulous needs evolved. It became apparent that the needs thus generated were unrealistic and would not be usable in plan formulation efforts, as the relative magnitude and weight of environmental considerations versus others related to national income efficiency or regional development were difficult to determine.

In order to make the environmental assessment more objective, various components of the natural environment were then inventoried and evaluated on a site-by-site basis; the overall methodology was refined further to more accurately identify, categorize, and quantify the natural features. Although it was realized that both economic and noneconomic considerations are fundamental to the planning process, Appendix U was narrowed in scope to more adequately present an appraisal of physical features and problems than would be possible if all other interacting forces were included. The various economically oriented needs associated with the environmental objective are included in other functional appendixes and are summarized in Appendix T, Plan Formulation, with only needs relating to the natural environment presented herein. The overall Environmental Quality Program, also presented in Appendix T, represents a blending of both the economic and noneconomic environmental needs.

SOURCES OF INFORMATION

Federal and State personnel having intimate knowledge of field conditions in each WRPA contributed most of the basic information and data used in determining the magnitude of various environmental needs. The size and exact location of particular features (lakes, timber stands, scenic rivers, etc.) were obtained from State outdoor recreation plans and similar publications, State legislation, information and educational brochures, various Federal publications, and topographic quadrangle maps. On several occasions, field investigations were conducted to develop a better understanding of environmental conditions in the region.

The participating States were asked to provide much of the basic data and most all of the information for the supporting narratives required to complete the individual WRPA sections. Having an intimate knowledge of the character and features of the planning areas, the States, more so than the Federal participants, were capable of identifying and describing environmental conditions and problems in the WRPA's.

The information submitted by the States varied in nature, scope, and level of detail; thus, the narratives often reflected emphasis upon certain particular aspects of the environment, rather than a balanced overview of conditions in a given planning area. For instance, the narratives for WRPA's 5, 6, 8, 9, and 10 dwell upon the forestry resources, but do not fully address the impacts of flood control, land drainage, water quality, and other environmental considerations which are fundamental to a thorough evaluation of an area.

DETERMINATION OF ENVIRONMENTAL NEEDS

The classification categories used for categorizing environmental components were based primarily upon "Principles and Standards for Planning Water and Related Land Resources" published by the United States Water Resources Council.

Environmental needs were determined quantitatively, using the following breakdowns:

a. Gross Need - The total resource in each category required to satisfy the environmental quality objective.

b. Existing Supply - That portion of the gross need which is either currently under controlled management or, due to natural limitations, is not likely to change status for the next 50 years.

c. Net Need - Gross need minus existing supply, a resource presently available which could disappear if positive measures are not taken to insure its future integrity.

The following is a description of the detailed methodology used in determining gross needs and existing supplies in each of the specific categories:

Scenic Rivers and Streams

Most of the rivers and streams included in this category were identified in pending or enacted State legislation. In addition to these waterways, others were included at the suggestion of knowledgeable State consultants. The total mileages of the identified streams or designated reaches thereof represent the gross needs.

Existing supplies in this category include streams or stream reaches which flow through areas now considered under controlled management or unlikely to change status for the next 50 years. Also, in the State of Louisiana, those streams already identified for preservation under State law comprise a portion of the existing supply.

After the net needs were finalized, the mileages were converted to acreages, using a 400-ft. (200 ft. each bank) greenbelt provision along each of the waterways.

Lakes

Gross needs in this category were based upon the primary objective of controlling the management of the water surface, water bottom, and shoreline, bearing in mind the impracticability of controlling the watershed. In some cases, this objective would require action toward the entire shoreline or water surface area of a particular lake, while in others only a portion of the peripheral land would be affected since existing management was considered satisfactory in other areas around the lake. Providing public access was another objective considered in determining gross needs for lakes since land ownership patterns around many water bodies in the region prohibit access by general public users, thus significantly reducing the effectiveness of the lake in satisfying demands.

Existing supplies in this category include those lakes on public lands, those incorporated into developments available for public use, and portions (water surface) of others which may be utilized if made accessible to general users.

The number of access points, length of required shoreline, and width of the access areas away from the shoreline varied from lake to lake, depending upon the size of the water body, present ownership or management patterns, necessary buffer zones, and other similar considerations. The finalized net needs were expressed in total acres of water surface and peripheral land.

Bottomland Hardwoods and Wetlands

Gross needs in this category generally include all bottomland hardwood acreage in each WRPA.

The existing supply of bottomland hardwoods includes tracts under protective ownership, controlled management, or in such a physical state (swamp expanse) as to be considered unlikely to change status over the next 50 years. It was assumed for several of the WRPA's (particularly in Louisiana) that all publicly owned forestry land and a substantial amount (50-80 percent, depending upon varying conditions and management practices) of privately owned commercial forest land will remain forest through 2020. Because the exact acreage of bottomland hardwoods in public and private ownership was unavailable, it was further assumed that the ratio of public to private ownership of total commercial forest would generally apply to bottomland hardwoods. Some adjustments were made to provide compatibility between the Land Resources Appendix figures and those published by various State agencies.

Open and Green Space

Gross needs in this category were determined by applying National Park Service per capita use rates (based upon space standards) to urban population data.

The existing supply includes all tracts of land now designated Class I recreation areas by the Bureau of Outdoor Recreation. Class I areas conform generally to high density population and are typically market or user oriented areas. The primary consideration in this land class is ownership, which is usually local government or private commercial enterprise.

Unique Geological and Botanical Systems

Gross needs in this category were determined by consensus of the State and Federal agencies participating in the study. The sites or areas considered include virgin timber stands, rare growths of plant communities, rare mineral deposits, outstanding geologic formations, etc.

The existing supply in this category includes areas or portions of areas already under protective ownership or management and others so located or situated as not likely to be endangered by encroachment.

Unique Ecological Systems

Gross needs in this category were determined by consensus of the State and Federal agencies participating in the study. Areas or sites considered include bottomland hardwood swamps and backwater areas, rare or unusual combinations or occurrences of plant and animal life, primitive backwood or wilderness areas, etc. The criteria used for identifying wilderness areas were taken from "Principles and Standards for Planning Water and Related Land Resources" (Water Resources Council).

During evaluation of individual environmental features, it was determined that characteristics of a particular site or area permitted inclusion of the particular feature in more than one needs category. Rather than place the feature in only one category, it was entered in all categories wherein the qualifications or criteria were met. In this manner, a feature having multiple facets or values accrued additional importance by virtue of its inclusion in several categories.

JUSTIFICATION OF ENVIRONMENTAL NEEDS

Justification of environmental needs in each of the several categories was founded upon premises established by authorities knowledgeable in forestry resources, fishery and wildlife management, watershed management, and other similar disciplines.

Needs in several categories were determined by the mere fact that particular resources are declining or disappearing, as in the case of bottomland hardwoods and inland wetlands. Although further justification of such needs is readily determinable, scarcity alone was considered a necessary and sufficient condition. Resources of national or regional significance, such as the diamond mine in Arkansas, the estuaries in Louisiana, and Crowley's Ridge in eastern Arkansas, generated legitimate needs simply because of their rare characteristics. Other areas, such as the system of oxbow lakes in Mississippi and elsewhere in the region, support unique ecological, geological, or botanical systems, and offer outdoor experiences of study, recreation, and enjoyment not to be found elsewhere.

More specific points of justification for certain major environmental needs are summarized in the following paragraphs.

Scenic Rivers and Streams

Free-flowing, unexploited streams provide "in situ" outdoor study areas for hydrologic, fluvial, and biological investigations.

Free-flowing, unexploited streams support peculiar ecological systems unlike those of regulated streams or lakes.

Unregulated stream actions, including flooding, are vital components of the natural flushing process in oxbow lakes and the rejuvenation of wetlands and backwater areas.

Free-flowing, unexploited streams and associated "greenbelt corridors" provide self-fulfilling, self-satisfying experiences in enjoying nature and contribute immensely to the aesthetic beauty and quality of the regional environment.

Flooding from unregulated streamflow contributes to ground-water replenishment and to soil enrichment through sediment deposition.

Natural Lakes

Oxbows and other natural lakes provide offstream storage and clarification basins for backwater or flood flows from the main stems of rivers.

Oxbows and other natural lakes and their associated "brakes" or "scatters" provide valuable fishery, waterfowl, and wildlife habitat and nursery grounds.

Natural lakes offer diversity and add to the aesthetic qualities of the region.

Natural lakes provide recharge areas for ground-water aquifers.

Bottomland Hardwoods and Wetlands

Virgin stands of various timber species are irreplaceable, and provide excellent sources of information about natural progressions and biological succession.

Forested areas provide aesthetic diversity and contribute significantly to the hydrologic cycle.

A major beneficial use of soils having critical erosion, wetness, or other limitations is commitment to forests.

Wetlands, particularly bottomland hardwoods, provide essential rookeries and nesting sites for wading birds and waterfowl, and habitat for various species of fur-bearing small and large game and numerous nongame songbirds.

Wetlands retard runoff in many areas and help to abate erosion and increase infiltration for ground-water replenishment.

Wetlands produce cash crops such as peat moss, wild rice, marsh hay, and bait fish.

Wetlands provide outdoor laboratories for scientific investigations in a natural setting.

Open and Green Space

Open and green space provides diversity and aesthetic enhancement in highly developed areas.

Open and green space provides noise absorption buffers.

Open and green space provides habitat for many songbirds, squirrels, and other small animals.

Beaches and Shores

Protection of beaches and shores affords protection to adjacent estuaries and marine nursery grounds.

Undeveloped beach and shoreline contribute valuable diversity and aesthetic enhancement to the region.

Undeveloped beach and shoreline provide a natural buffer against tidal waves, hurricanes, and other associated disasters.

Wilderness Areas

Wilderness areas provide valuable outdoor laboratories for nature study and fundamental scientific observation.

Wilderness areas provide opportunities for retreat into a primeval setting and thus offer an outlet for man to examine his true identity and relationship to other forms of creation.

Wilderness areas are valuable components of the transpiration and percolation phases of the hydrologic cycle.

Unique Ecological, Geological, and Botanical Systems

Areas or sites of rare plant, animal, or geological occurrences provide valuable "in situ" study areas for scientific study.

Areas or sites of rare plant, animal, or geological occurrences are often irreplaceable remnants of our natural heritage, the loss of which could not be recovered.

HISTORICAL PERSPECTIVE

Today more than 6 million people inhabit the Lower Mississippi Region and depend upon its natural resources to supply their demands for living space, food and fiber, minerals, municipal and industrial water supplies, power production, fish and wildlife, and for recreation. In addition to these demands, there are others for maintaining aesthetic and cultural values and for maintaining the quality of the natural environment.

The current concern about the quality of the natural environment is an outgrowth of the knowledge and experience gained through many years of stewardship over our natural resources. Through hindsight, it is evident that our stewardship could have been better and should be improved now while there is still time to preserve some of the yet unaltered natural resources for the benefit of future generations. To gain a better understanding of the scope and substance of man's impact upon and compatibility with the natural environment of the Lower Mississippi Region, it is perhaps appropriate to briefly review the prehistory of the region and then retrace a few of man's footsteps through the area.

PREHISTORY

Physiographic Development

The Mississippi River originated in the Pleistocene glaciation era which is a Quaternary division of the Cenozoic era. At that time, Canada and the northern United States were largely covered by ice. The continental ice sheets did not extend into the Lower Mississippi Region, but cyclic Pleistocene glaciation nevertheless was responsible for deranging preglacial drainage and creating the southward-trending river and valley which carried large volumes of glacial meltwater and outwash on several occasions. It also was directly or indirectly responsible for the origin, character, and distribution of virtually all Quaternary deposits and formations in the region.

Each cycle of advancing and retreating glaciation involved generally the same sequence of changes. The sequences, consisting of valley degradation and stream entrenchment during glacial advance followed by valley alluviation or filling during glacial retreat, were repeated five times during the Quaternary, a period of time estimated to have lasted about 1.5 million years.

Midwestern glacial stratigraphy indicates that the last glacial advance occurred about 10,000 to 11,000 years ago, after which time the ice sheet withdrew north of the Great Lakes. The withdrawal probably took place by at least 9,000 years ago, which is roughly the time that the Ohio and Mississippi Rivers are believed to have occupied the lowest level of braided stream terrace adjacent to Sikeston Ridge near Sikeston, Missouri. For the next 2,000 or more years, the Mississippi River was meandering as far north as Memphis, Tennessee, but about 7,500 years ago the river began to slowly abandon its initial meander belt.

About 6,000 years ago a major event took place with the diversion of the Mississippi River from the lowest level of braided stream terrace through a gap in Crowley's Ridge (Thebes Gap) into the area east of Sikeston Ridge. This diversion appears to mark the date of the change of the last segment of the river from a braided to a meandering regime. From that time on, the Mississippi and the Ohio Rivers joined near Cairo, Illinois, and maintained a meander belt along the eastern side of the Valley to near Memphis.

From 6,000 to 2,000 years ago a series of meanders occurred. The last major Mississippi River meander belt shift occurred as a result of a diversion near Vicksburg, Mississippi, from Walnut Bayou Meander Belt into the back swamp at the base of the valley wall between Vicksburg and the vicinity of the mouth of the Red River. It is believed that this last river diversion started about 2,800 years ago and was

finalized within several hundred years. All cheniers in the coastal area of the region are younger than 2,800 years and all are related to shifts in sedimentation patterns.

Through time, the Mississippi River used several independent outlets or distributaries to the Gulf. The Atchafalaya outlet is still active, and in fairly recent times there were two other active distributaries on the western side of the Mississippi River. Bayou Plaquemine headed at Plaquemine, Louisiana, and flowed 80 miles to the Gulf. It was blocked off from the Mississippi by the construction of the west bank levee in 1867-68. Then, in 1909 a lock was constructed at Plaquemine, permitting navigation between the Mississippi and the bayou. (This lock has not been used in recent years, and a levee is now being constructed to seal off the lock from the river.) Bayou Lafourche headed at Donaldsonville, Louisiana, and followed the main position of an abandoned Mississippi River meander belt for approximately 90 miles to the Gulf. It ceased to be an active distributary when a dam was constructed across its head at Donaldsonville.

There were also distributaries on the eastern side of the Mississippi River which were active prior to the time of recorded history. There was just one on the eastern side though that was active in fairly recent times. It was Bayou Manchac and it headed about 15 miles below Baton Rouge, flowed eastward through a gap in the low uplands, and emptied into Lake Maurepas. It ceased to be active in 1828 when a dam was constructed across its head.

Civilizations

It is generally believed that primeval man crossed the Bering Strait on a land bridge and first appeared in the New World as early as 40,000 years ago, during the latter stages of Pleistocene glaciation. Traveling from the western coast of North America, they probably followed a relatively ice-free route east of the Rocky Mountains to a point below the southern edge of the glacier, where they branched into the southwest and southeast. At what point in time they ventured into the Lower Mississippi Region is unknown, but there is evidence to indicate their presence in the region about 10,000 B.C. Thus, human life and cultures existed along the Mississippi long before recorded history and archeologists have brought to light the story of fascinating peoples - mound builders, painters of the great rock bluffs, potters, and agrarians.

ANCIENT HISTORY

The earliest known dwellers in the region appeared about 12,000 years ago and were nomadic bands of hunters, probably seeking large game such as mammoth and mastodon, or possibly other now extinct animals. These hunters roamed the hills and valleys of the northern portion of the region, probably following Crowley's Ridge into what is now the State of Missouri, but concentrating their activities in the present day States of Arkansas and Tennessee. There is evidence to indicate that they also ventured south into the lower portion of Louisiana, west of the Mississippi River. In general, they blended with and used the environment, but left hardly a trace upon it.

About 8000 B.C. the Indians became less nomadic; however, for the next six to seven thousand years, they continued to live by hunting and gathering wild food. During this period they extended their range of activity, hunting and camping along most reaches of the Mississippi River, its tributaries, and along the coastal streams.

It was not until sometime between 2000 B.C. and 1200 A.D. that the Indian culture had any noticeable impact upon the natural environment of the Lower Mississippi Region. It was during this period that the practice of agriculture began, and by the time Spanish explorer Hernando De Soto entered the lower valley in the 1540's the Indians were densely settled in large farm communities surrounded by acres of cropland.

RECENT HISTORY

The Frenchmen who began to settle in the southern portion of the region in the early 1700's, and the Americans who moved into the central and northern portions during the late 1700's generally followed the precedent of the Indians and established their economic base upon the cultivation of crops. This economic base was small and somewhat unstable throughout the 18th century, and the agricultural practices of those days, by and large, had little impact upon the natural environment. Most of the rivers and streams, lakes, wilderness areas, wetlands, and other ecological systems remained in their virgin state, simply because the cultural demands of the small and diffuse population could be met by utilizing only a fraction of the region's total resources.

With the advent of the 19th century came increasing settlement and expanding agricultural activity in the region. Sugar had been granulated from cane juice just prior to the turn of the century, and cane crops soon formed the basis of a tremendously successful industry. Cotton also became a great cash crop in the early 1800's and by 1860 cotton production was thriving throughout the valley, with 60 percent of the world crop coming from the Lower Mississippi Region. The production of these crops and others in the lower valley required large-scale land clearing, and levees had to be constructed to protect the cultivated land from the ravages of flooding. Intense demands for navigation improvements to facilitate water transportation of the agricultural products first arose shortly after the steamboat made its appearance on the Mississippi River in 1812, and as early as 1824 the U.S. Congress authorized navigation improvements on the river.

By the early 1900's the natural environment was undergoing widespread alteration by an increasing population in search of economic growth and development. Railroads and land companies were actively promoting resettlement and land development, and were successful in attracting farmers from the Great Lakes States and the Corn Belt to newly drained marsh and swamp land, particularly in the Louisiana portion of the region. A diversified commercial agriculture was established in the Mississippi delta, a livestock economy was started, and the rice economy, with its large acreages of irrigated land, was expanded. Conjunctively, with this water and land resource development activity, there were increasing demands for more effective flood control measures, and the Congress responded through general legislative enactments and through repeated authorization for specific types of projects, such as levees, dams, and channel modifications.

Over the past 150 years the efforts of private interests, and of local, State, and Federal governments, to mold and reshape the natural environment of the lower Mississippi valley for man's benefit have multiplied manifold. Of the 65.5 million acres in the region, almost half have been developed or are designated for agricultural uses,

exclusive of timber production. More than 2.3 million acres of land are covered by urban sprawl, and many thousands of acres have been borrowed from the land resource base through inundation by large and small reservoirs serving the primary purpose of flood control, while providing ancillary uses such as recreation, fish and wildlife, and water supply. In addition, more than 3,300 miles of the region's waterways have been developed in the interest of navigation, and almost 2,700 miles of stream and river channels have been modified in the interest of flood control and land drainage.

Most of the development activities of the past have provided some benefits to mankind, but not necessarily to the natural environment. Fortunately, the natural environment of the Lower Mississippi Region is composed of diverse features, such as scenic rivers and streams, natural lakes, beaches and shores, bottomland hardwoods, and others, that lend themselves to conservation, preservation, or restoration. These components and the needs for them are discussed in detail in the remainder of this appendix.

REGIONAL SUMMARY

ENVIRONMENTAL SETTING

General

The area encompassed by the Lower Mississippi Region (figure 1) includes the drainage area of the Mississippi River below the Ohio, except for the White, Arkansas, and Red Rivers above the effects of the Mississippi River backwater. It also includes the flood protected area at Cairo, Illinois, and the entire coastal area between the drainage divides of the Pearl and Sabine Rivers. It extends approximately 600 miles in a north-south direction, varies from 100 to 300 miles in width, and includes approximately 102,400 square miles of area in portions of seven States.

This vast area is located entirely within the Central Gulf Coastal Plain except that the upper portion of the Ouachita River Basin extends into the Ouachita Mountains west of the Gulf Coastal Plain. It has a subtropical climate, a wide range of natural land forms and water.

Land Forms

Land forms in the region are controlled mostly by what occurred in ages past. The sinking and rising, buckling and tilting, cooling and warming of the earth's surface and the effects of water and wind upon that surface, plus the hardness or erodibility of various portions of the earth's crust, were the principal determining factors. Through the influence and interrelationships of such factors, the major land forms that now exist in the region vary from flat coastal marshes, to gently sloping alluvial valley lands, to rolling coastal plain uplands, to rugged mountains. Specific physiographic areas where these land forms can be found are shown in figure 1.

Alluvial Valley

Physiography. The largest and by far the most important land form within the region, and one of the most sharply defined physiographic areas of the United States, is the Mississippi River Alluvial Valley. This gulfward sloping lowland, which extends from Cape Girardeau, Missouri, to the Gulf, slightly resembles an elongated horn or cornucopia. It averages 50 to 75 miles in width throughout most of its 600-mile length. It attains a maximum width of 125 miles at the latitude of Helena, Arkansas, but is only 25 miles wide at the latitude of Natchez, Mississippi.

The Alluvial Valley includes both the flood plain subject to seasonal flooding and dissected alluvial plains not completely covered by flood water. The flood plain has a total area of about 35,000 square miles. The dissected alluvial plains, once a part of the river flood plain, are located in the northern and central parts of the Alluvial Valley and cover nearly 15,000 square miles. They are, for the most part, set off from the flood plain by definite escarpments. The stream valleys incised within the dissected alluvial plains are subject to backwater flooding.

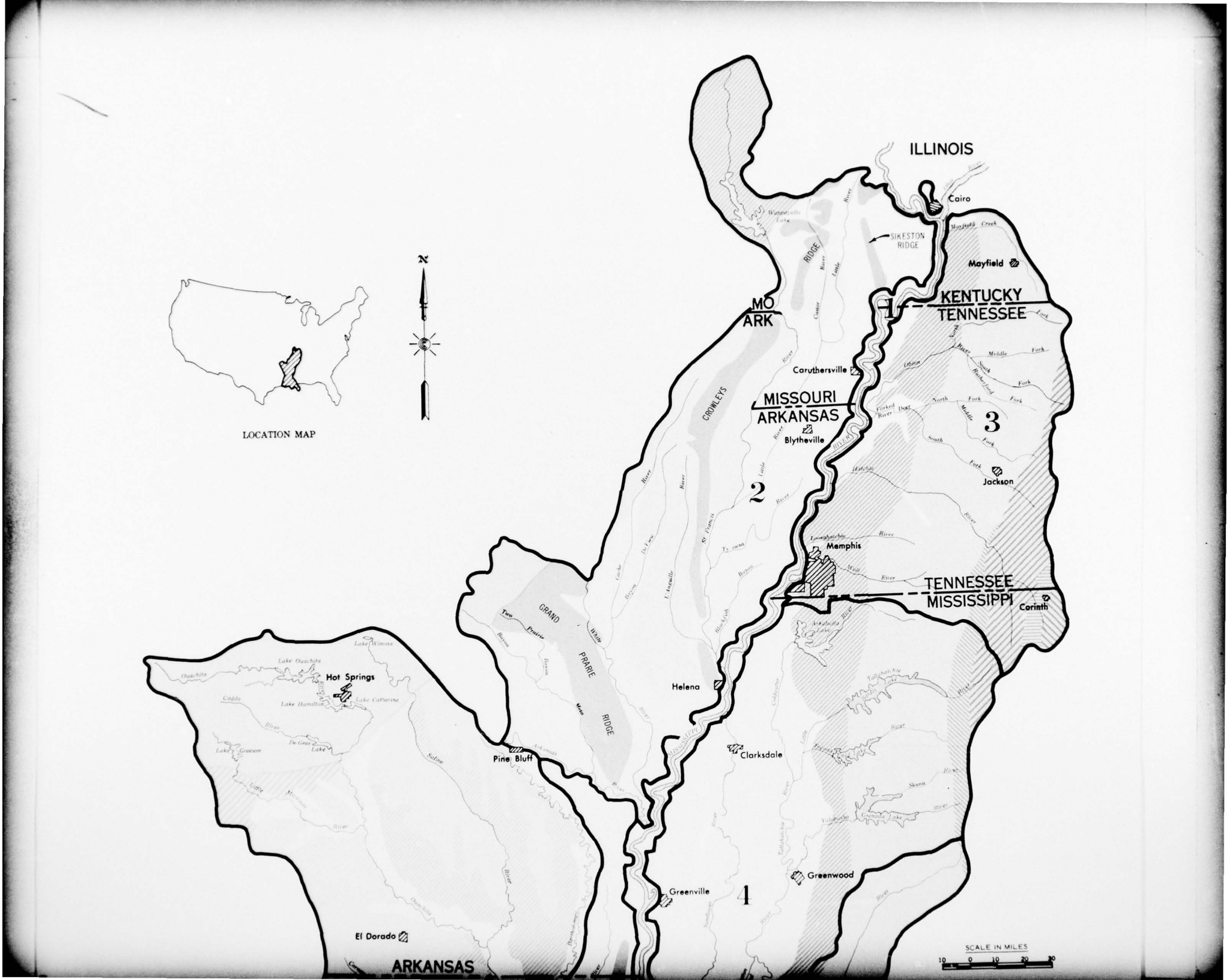
Steep bluffs are along most of the eastern and western margins of the Alluvial Valley. The bluff escarpments along the eastern boundary are well defined. They are regular in form and direction, and stand from 75 to 200 feet above the flood plain. The western wall of bluffs, however, is much lower and less regular than the eastern wall. The bluffs along the western wall rarely exceed 150 feet and often are less than 50 feet high. Where there is no obvious topographic boundary, differences in soil and to a lesser degree in vegetation are apparent. These differences serve to identify the Delta.

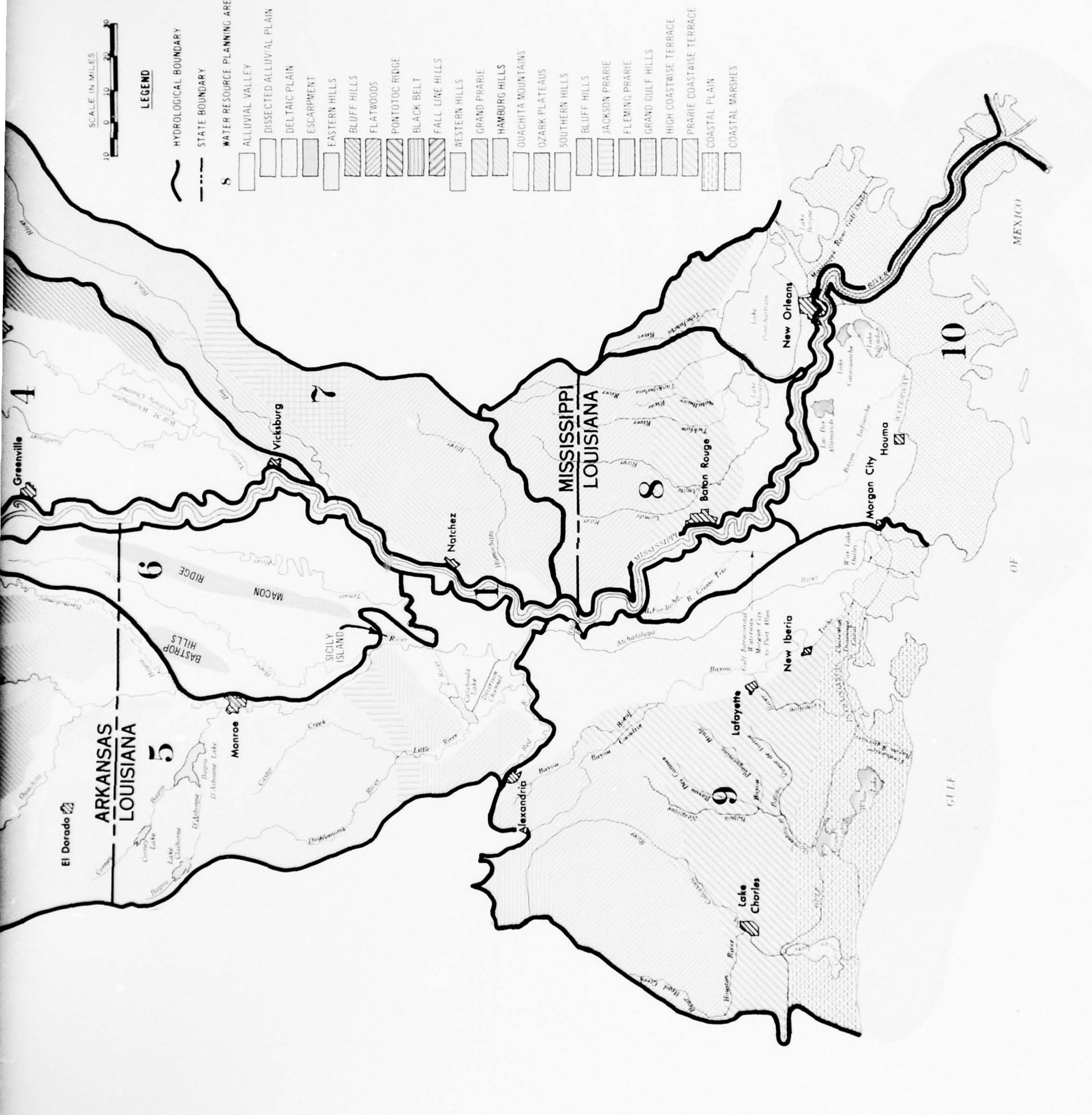
Both the eastern and western bluff walls are broken by the alluvial valleys of the tributary streams. The only streams that are major tributaries before they enter the Alluvial Valley of the Lower Mississippi River are on the western side, but minor tributaries on both sides also are of considerable importance in helping to maintain scenic and other environmental qualities of the uplands beyond the valley walls.

The valley surface is not a continuous plain. It is broken by several upland areas that rise like islands above the flood plain. The most prominent upland area is Crowley's Ridge in WRPA 2. Others include Sikeston and Grand Prairie Ridges in WRPA 2; Sicily Island in WRPA 5; and Bastrop Hills and Macon Ridge in WRPA 6.

These ridges and intervening streams flowing into the Mississippi cut the Alluvial Valley into a series of drainage basins. The St. Francis in WRPA 2, the Boeuf and the Tensas in WRPA 6, the Yazoo in WRPA 4, and the Atchafalaya in WRPA 9 are all more or less independent units of the Alluvial Valley. However, all of these, except the Atchafalaya, are subject to Mississippi River backwater at their lower ends. There are identifiable lowlands such as those of the Red and the Ouachita Rivers. These are within the Valley areas whose alluvial origin has been modified by tectonic action. Attributable to the New Madrid earthquake of 1811-12 are the so-called "sunk lands" of Missouri and Arkansas (WRPA 2), Reelfoot Lake area of Tennessee (WRPA 3), and the uplifted and flood-free section of Lake County, also in Tennessee (WRPA 3).

Of somewhat varied origin and age, the ridges have natural characteristics quite different from those of the flood plain - differences reflected in different occupance values for man. The flood plain is


LOCATION MAP
N
ILLINOIS
Cairo
Mayfield
KENTUCKY
TENNESSEE
SIKESTON RIDGE
MO
ARK
Caruthersville
MISSOURI
ARKANSAS
Blytheville
CROWLEYS RIDGE
Jackson
Memphis
TENNESSEE
MISSISSIPPI
Corinth
GRAND PRAIRIE
Helena
Hot Springs
Pine Bluff
Clarksdale
Greenwood
Greenville
El Dorado
ARKANSAS
1
2
3
SCALE IN MILES
10 0 10 20 30



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

PHYSIOGRAPHIC AREAS

FIGURE 1

improperly pictured as a flat, featureless, uniform monotony. While the degree of relief is small, even small variations are of meaningful consequence. The flood plain must be measured with a special vertical scale. Then, there appears the gouge of an abandoned channel or the eminence of a natural levee crest with a short slope to the river and a long slope to the backswamp. Added variety is given the flood plain by the hydrology, the patterns of meandering rivers and bayous, the swamp with standing water, cutoff lakes, the bottoms flooded with backwater from unprotected streams with only the crests of natural levees emergent.

The present course of the Mississippi River runs close to the eastern wall of the Alluvial Valley, except from Memphis to Vicksburg and from the vicinity of Baton Rouge to the coast. In the upper reach, it swings west in a great arc, leaving 4.2 million acres of the Yazoo-Mississippi Delta as the greatest of the eastern alluvial basins of the Mississippi River. Below Baton Rouge, it divides the Deltaic Plain into almost equal parts.

The Deltaic Plain of the Mississippi River extends from the head of the Atchafalaya River to the coast. This near-sea-level plain in WRPA's 8, 9, and 10 has an area of approximately 13,000 square miles. It is limited on the east by the mouth of the Pearl River and on the west by the mouth of the Vermilion River. The three types of land within the deltaic plains are forested swamps, natural levees, and coastal marshes. A few cheniers, which are old beach formations, also occur within the deltaic plain and offshore bars are well developed in a 60-mile arc southeast of the deltaic plain.

The main natural levee ridges in the Deltaic Plain include the ones along the present course of the Mississippi River. They also include Teche Ridge and the Atchafalaya Ridge in WRPA 9, and LaFourche Ridge in WRPA 10. These divide the Deltaic Plain into a number of lowlands, the more important of which are the Atchafalaya Basin in WRPA 9, Lake Pontchartrain Basin in WRPA's 8 and 10, and the Lake Borgne and Barataria Depressions in WRPA 10.

Vegetation. The tree which is most representative of the Alluvial Valley is the cypress. Although this tree is confined to growth along stream courses and to moist soil at other locations, it probably has a greater north-south and east-west natural range than any other tree growing within the region except the sweetgum and black willow.

In the extreme southern part of the Alluvial Valley, and extending into the Coastal Marshes, there are extensive swamplands in which the dominant vegetation is cypress (Taxodium distichum) and tupelo (Nyssa aquatica). Growing along with these two dominant species are other species which also are capable of surviving in a habitat which stays wet all year. One of these is button bush, or "button willow" as it

is commonly called, (Cephalanthus occidentalis). Growing on the chenieres and natural levees within this same latitude are dry land varieties including the live oak (Quercus virginiana) which is the dominant species.

In the central and northern portions of the Alluvial Valley, the plant communities change to a larger mixture to upland varieties as the elevation of the terrain increases. Cypress, tupelo, and button bush, however, still continue to grow in the swamps wherever swamps occur locally throughout the valley; but the natural range of the live oak does not extend very far into the central portion of the Alluvial Valley. Overcup oak (Q. lyrata) and bitter pecan (Carya aquatica) are frequently the dominant varieties growing on land that is slightly higher than the adjoining swamps. Then on land that is a foot or two higher, such trees as Nuttall oak (Q. nuttallii) and willow oak (Q. phellos) become dominant. Willow (Salix interior and S. nigra) and cottonwood (Populus deltoides) are the first trees to become established on land that has been formed by accretion. After the land is built up a little higher, and after perhaps more than a quarter of a century has elapsed, other varieties such as sweet pecan (Carya illinoensis), hackberry (Celtis laevigata), sweetgum (Liquidambar styraciflua) and sycamore (Platanus occidentalis) became established.

On the better drained sites, on bluff ridges, and on terrace lands, there is usually a mixed growth of oaks and other hardwoods which includes white oak (Q. alba), post oak (Q. stellata), dogwood (Cornus florida), and some of the more upland hickorys such as shagbark hickory (Carya ovata).

On the crests of the ridges and on some soil types the dominant tree growth is loblolly pine (Pinus taeda), southern red oak (Q. falcata), white oak, and black gum (Nyssa sylvatica).

Coastal Plain Uplands

Physiography. The Alluvial Valley is by far the most important major land form within the region, but there are three other important major land forms. Two of these, the Coastal Plain Uplands and the Coastal Marshes, like the Alluvial Valley are part of the Central Gulf Coastal Plain which is one of the major physiographic divisions of the North American Continent. The other major land form within the Lower Mississippi Region, the Ouachita Mountain Area, lies outside the Central Gulf Coastal Plain.

The Central Gulf Coastal Plain is everywhere an area of moderate or low relief with elevations ranging from approximately 800 feet down to sea level. The 800-foot elevations, though, occur east of the boundary of the Lower Mississippi Region. This results in the peak elevations (almost 600 ft.) on Crowley's Ridge, which is part of the Alluvial Valley, being the highest ground inside the Lower Mississippi

Region except the Ouachita Mountain portion. .A few areas in the hill lands of southwestern Mississippi are above 500 feet in elevation, but no part of Louisiana or coastal plain Arkansas reaches an elevation of 500 feet.

The Gulf Coastal Plain is characterized by a belted topography of alined hills and valleys which can be traced as definite units for long distances. In the Mississippi Embayment, the topographic units in the Eastern and Western Hills Sections parallel the inland border of the region. South of the embayment in the Southern Hills Section they trend with the Gulf shoreline.

Eastern Hills Section. The Eastern Hills Section lies east of the eastern bluff escarpment of the Alluvial Valley. It is limited landward by the Appalachian Mountains and the Interior Low Plateaus. Its southern boundary is the lowland belt of the Jackson Prairie, which is the northernmost element of the coastwise belted topography of the Southern Hills.

Included for convenience within the Eastern Hills section are the distinctive Bluff Hills or Loess Hills which lie within a zone 5 to 25 miles wide along the entire western margin of the Eastern Hills section. They also extend southward below the Eastern Hills section to within a short distance of the Mississippi-Louisiana State line.

These Bluff Hills are characterized by a mantle of loess which provides a distinctive topography. These hills are well dissected along the border of the Alluvial Valley. They are similar to Crowley's Ridge in that they are subjected to very severe sheet erosion but very little vertical erosion. As a result, the sheet erosion virtually prevents extensive row cropping in some areas. In these same places, the lack of vertical erosion enables the sides of deep cuts for roadways to stand for many years almost as if the side walls were protected by a poor grade of cement.

Western Hills Section. The western boundary of the Alluvial Valley and the western boundary of the Gulf Coastal Plain almost coincide north of the Arkansas River. The Western Hills extend southward from the Arkansas River to the Jackson Prairie. The belted character of this section is not as distinctive as the Eastern Hills section. The valleys of the Ouachita River and several minor tributaries cut through the Western Hills section. These valleys have their own alluvial areas which support a hardwood growth of timber, but the section as a whole is gently rolling and supports pine or mixed pine-hardwood timber.

Southern Hills Section. The Southern Hills include the hill and valley belts parallel to the Gulf shore and the seaward-sloping terraces. The continuity of the Southern Hills is interrupted by the Alluvial Valley, but the trend of belts is essentially the same on both sides of the Mississippi River.

From a purely visual point of view of terrain surface characteristics, there is not much difference between the Eastern and Western Hills Section and the northern portion of the Southern Hills Section. All three are essentially hilly regions. There are, though, more differences in the vegetation. The vegetation over much of the Eastern and Western Hills is a mixture of pine and hardwood, with the pine consisting mostly of loblolly and shortleaf (P. echinata). The vegetation over much of the Southern Hills is predominately longleaf pine (P. palustris). Hardwoods dominate the growth in stream valleys in all three hill sections, but hardwoods in the stream valleys of the Southern Hills Section are usually draped with Spanish moss.

There is a pronounced difference in terrain characteristics between the northern and southern portions of the Southern Hills Section. The southern portion of the Southern Hills Section is a large, flat prairie terrace land which slopes seaward at only about 1 foot per mile until it merges with the coastal marshland.

The northern portion of the Southern Hills Section is largely a Prairie Coastwise Terrace. The soils of this terrace east of the Mississippi River produce a better growth of hardwoods and second growth pine-hardwoods than west of the river.

West of the Mississippi River, the Prairie Terrace belt is wider and a truer prairie condition exists. This condition consists mostly of prairie type vegetation or grassland dotted with clumps of hardwoods and with narrow bands of bottomland hardwoods along stream courses. The subsoils are usually impervious, making drainage poor and causing much standing water after rains.

These prairie lands in southwestern Louisiana are the only natural prairie areas of any appreciable size within the Lower Mississippi Region except Grand Prairie in Arkansas (WRPA 2). Grand Prairie, however, contains considerably less than 400,000 acres of natural open land, while the Louisiana Prairie contains considerably more than 2,000,000 acres of natural open land.

To most people the visual quality of any prairie is relatively poor because of lack of contrast. The Louisiana prairie is no exception. One can look for miles over flat prairie and see only scattered wooded clumps and fringes of trees. These are very important because the environment would be all the bleaker without them and special efforts should be made to preserve them.

Vegetation. Longleaf pine is the dominant tree species on the southern ends of the Coastal Plains Uplands on both sides of the Alluvial Valley. Portions of the longleaf pine lands which have been cut over are barren grasslands and appear to be suitable only for pasture. On the central and northern portions of the Coastal Plains

Uplands, the longleaf pine at first gives way to loblolly pine and then farther north to shortleaf pine. These pine stands are interspersed with a greater variety of hardwood tree species than the longleaf pine areas. Southern red oak, blackjack oak (Q. marilandica), and post oak are the dominant species of hardwoods in many areas of mixed pine-hardwoods and also in many upland areas not suitable for pine.

The creek bottoms within the Coastal Plains Uplands support a good growth of mixed bottomland hardwoods. Magnolia (Magnolia grandiflora) is a common tree growing in some creek bottoms in southern Mississippi and Louisiana, while sweetgum is a common tree in the creek bottoms throughout the Coastal Plains Uplands. Also, sweetgum, along with persimmon (Diospyros virginiana), sassafras (Sassafras albidum), and sumac (Rhus spp) are among the first varieties to sprout up in a cultivated field or pasture that is reverting to forest growth.

Coastal Marshes

Physiography. Except for small areas within the Sabine and Pearl River basins, the Louisiana coastal and estuarine zone lies within the area encompassed by the Comprehensive Study of the Lower Mississippi Region. Bordering the Gulf of Mexico and extending inland for a distance averaging 35 miles are the coastal marshlands - a tremendously interesting and ecologically important terrain feature.

This major terrain feature contains approximately 2.4 million acres of natural marshes (i.e., land areas covered with marsh-type vegetation). In general, the natural marshes may be divided into fresh, intermediate, brackish, and saline, as one progresses from inland areas to the Gulf. These marsh belts lie across the coast of Louisiana in varying widths. The coastal marshes may also be divided into the Active Delta, the Inactive Delta, and the Cheniere Plain Marsh zones.

The Active Delta Marsh zone surrounds the mouth of the Mississippi River. This zone contains approximately 120,000 acres of predominantly fresh and intermediate marsh and is made up of several stratified zones from the higher land to the newly formed flats at the tip of the passes.

Adjacent to the Active Delta zone is the Inactive Delta Marsh zone, (Sub-Delta) which extends from the mouth of the Pearl River to the Vermilion River. This large marsh area, the most productive fur range in the United States, consists of more than 1.4 million acres. Most of the Inactive Delta Marshes are fresh to brackish but there is a belt of salt marshland along the Gulf. The salt marsh portion is well drained by tidal bayous and is subject to strong salt tides.

Portions of both the fresh water and brackish marshes have a firm floor of clay and other portions are floating because the clay pan has subsided. Essentially the same species of plants, however, are growing

on both the firm bottom and the floating marshes except in those limited portions where remnant cypresses are growing on areas that have subsided.

Adjacent to the Inactive Delta zone and extending beyond the western boundary of the region is the Cheniere Plain Marsh zone, which contains approximately 860,000 acres. Geologically the Cheniere Plain Marshes are much older and more stable than the other marsh types. To begin with, a clearly defined beach line is present and the marsh floor is relatively firm with a shallow layer of peat overlying the clay pan. A series of higher ridges running parallel to the coast, old beach formations (chenieres) which support a higher land type of vegetation, are located through this zone.

Casual visitors motoring through some portions of the marshlands are denied an opportunity to obtain a true visual impression of this terrain feature. Only by flying over the coastal area can one obtain an appreciation for the tremendous expanse of the coastal flats and the visual patterns formed by the intermingling of low-lying lands with natural bodies of water and man-made bodies of water which consist primarily of canals and boat lanes. This vast area is marked occasionally with ghost bald cypress swamps. It is also marked by narrow bands of live oaks and other trees growing on natural levees and on chenieres.

Most of the roads, as well as most of the communities, homes, farms, and trees, are located along natural levees and chenieres. This accounts for the reason motorists, in some portions of Louisiana, can travel for considerable distances in the marsh area without seeing the marsh.

Louisiana marshlands as a whole are so uniform in outward appearance and, in most places, distances are so large between contrasting landscape features that to an outsider the terrain is monotonous. However, the terrain is so different from that which is found throughout most of the rest of the Nation that for most visitors, who do not get to see much of the marsh anyway, the monotony is more than compensated for by numerous items of special interest. These items of special interest include shrimp boats, barges, drawbridges, canals, and other facilities and paraphernalia necessary to maintain an economy and a way of life which is largely water-oriented. As for the people who grew up in the marsh country and who actually do go out into the marsh, they apparently do not need contrasting scenery to have an interest and a feeling of security within that particular environment.

Vegetation. In each of the fresh, intermediate, brackish and saline marshes, some plant species gain dominance because ecological conditions are best for them. For instance, in the Active Delta Marsh zone, freshwater three-square (Scirpus americanus) and delta duck potato (Sagittaria platyphylla) are the dominant species on the newest

formed land at the tip of the passes. On slightly older and higher ground roseau cane (Phragmites communis) is the dominant species, with plant communities of water hyssop (Bacopa monniere), dogtooth grass (Panicum repens) and bulltongue (Sagittaria falcata) in the intermediate marshes, and alligator weed (Alternanthera philoxeroides) and elephant's ear (Colocasia antiquorum) in the fresh marshes. As one progresses to ground that is older and a few inches higher in elevation, the species making up plant communities gradually change until climax species, which include some trees such as willows and eventually live oaks, begin to appear. Essentially the same types of plant communities, but involving other species of plants, such as oyster grass (Spartina alterniflora), saltgrass...*, are to be found in the salt to freshwater areas of the Inactive and Cheniere Plain zones.

The differences in marshland vegetation are not apparent to the casual visitor to the area. This is because most marsh vegetation, whether growing in a salt, brackish, intermediate, or fresh water marsh, has essentially the same outward appearance. As one progresses inland from the marshlands, interest shifts from the grasses and rushes of the marshes to larger and more advanced forms of plants. Some broad leaved flowering plants and shrubs such as palmetto (Sabal minor), French mulberry (Callicarpa americana), and sumac (Rhus spp.) add interest to the scene but most visual interest for plants throughout the region is in the trees.

Different tree species, like different marsh grass species, gain dominance because ecological conditions are best for them. The salt marshes of the Coastal area have fewer kinds of plants growing in them than do the other marsh types because of the relatively severe plant growth limitations imposed by salinity.

Louisiana Beaches. A well-defined beach line is present along the western one-fourth of the Gulf coast in WRPA 9, and few scattered beaches occur elsewhere. The beaches have a muddy colored sand and are not as attractive as the cleaner looking white sand beaches of the Florida gulf coast. There is also more floating trash, which lowers the aesthetic qualities.

Lack of access roads limits the use of the beaches, but where access is available the beaches receive use by many recreationists.

Ouachita Mountains

Physiography. The boundary of the study region encompasses the entire drainage area of the Ouachita River. The lower portion of the Ouachita River drainage area enters the Alluvial Valley near Monroe,

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* (Distichlis spicata), black rush (Juncus roemerianus), wiregrass (Spartina patens), cutgrass (Zizaniopsis miliacea), and cattail (T. latifolia)

Louisiana. The portion of the area upstream from Malvern is in the Ouachita Mountains. This major land form includes the headwaters of other drainage basins. The part that is within the Ouachita drainage basin is slightly triangular in shape and extends approximately 90 miles from the edge of the Coastal Plain up the Ouachita River in a northwesterly direction toward Oklahoma. The width of the area along the edge of the Gulf Coastal Plain, or the base of the rough triangle, is approximately 75 miles.

The Ouachita Mountains in WRPA 5 are quite different from the rest of the Lower Mississippi Region. Higher elevations extending more than 2,000 feet above sea level are within these mountains and many of the slopes are much steeper than elsewhere within the region. Much of the terrain is also very rocky.

The ancient heritage of the Ouachita Mountains is also quite different from that of the Coastal Plain. The Ouachitas in remote ages were subject to intensive structural movements. The area was squeezed and the beds of rock were warped, twisted, and folded. This accounts for much of the rough and rocky terrain. There is a tableland which geologists refer to as the Athens Piedmont Plateau which makes a shelf between the mountains and the Gulf Coastal Plain. The elevation of the tableland goes down from about 1,000 feet above sea level, next to the mountains, to 400 feet where the bench drops off into the coastal plain.

Major portions of the Ouachita Mountains are heavily forested. Not only does the area contain most of the Ouachita National Forest, but large lumber companies own other vast acreages which are being maintained in timber production.

Vegetation. The highest peaks and ridges of the Ouachita Mountains support low quality growth of blackjack oak, post oak, dogwood (Cornus spp.) and elm (Ulmus spp.) or a mixture of shortleaf pine and hardwoods. Pine becomes more prominent on the lower slopes and the merchantable quality of the hardwood timber increases. River birch (Betula nigra) and witch-hazel (Hamamelis virginiana) usually grow along with redgum (or sweetgum as it is called locally) in the upper portions of the creek bottoms while willow, buttonbush, bald cypress, sycamore, and American elm (Ulmus americana) usually grow along the lower portions of these same creeks. Fagus grandifolia, or beech (Fagus spp.), also grows in some of the alluvial valleys of the tributary streams of the Ouachita River.

Huckleberry (Gaylussacia spp.) is a common understory plant in many parts of the Ouachita Mountains. It produces abundant fruit during most years. Another producer of wild fruit which is less common is the muscadine. It grows at scattered locations throughout the area.

Formerly cultivated fields which are permitted to lie idle usually

are initially invaded by broomsedge (Andropogon virginicus), blackberry (Rubus spp.), sumac, persimmon, sweetgum, and pine as they begin their successional stages leading to climax forest.

Differences in soil and moisture conditions and, to a lesser extent, differences in temperature account for the internal differences in plant communities growing within the Ouachita Mountains, Alluvial Valley, and the Coastal Plains Uplands.

Land Use

General

The Lower Mississippi Region comprises about 62.5 million acres of land. Of that, 27 million acres (41 percent) are used exclusively for crops and livestock. About 45 percent is forest land, over 4 million acres of which are pastured. Nearly 4 percent is in urban and built-up uses, but this use is increasing. The rest - 10 percent - is used for other purposes, such as mining, rural nonfarm residences, public installations, and facilities for parks, recreation and wildlife refuges, and water areas. Approximately 96 percent of the land is in private hands, while the remaining 4 percent is owned by Federal, State, and local governments.

But land constitutes more than just surface acreage. It embraces the complex biological systems of the soil, plants, and animals, which are all part of a continuing life cycle (ecology as we call it today). Our understanding of these biological processes, particularly of the permanent damage that begins subtly with piecemeal alterations of the land, is still limited. Yet our dependence upon stability is enormous.

Forests

The vast tracts of timber in the region, nearly 30 million acres, provide lumber for building cities and paper for the complex workings of the industrial economy. They also provide recreation sites, extensive areas of scenic beauty, pasture for livestock, and a haven for wildlife.

Natural vegetation of the region marks the Valley as oak-gum-bald cypress forest. Certain species occur throughout the length of the Valley. Among them is the bald cypress, though extensive solid stands are largely restricted to southern Louisiana. Native cane is everywhere present latitudinally, but in much lesser stands than in years gone by. It has been suggested that cattle grazing or the restriction of fires that favored cane's spread are responsible. The live oak is apparently a native forest tree only as far north as Baton Rouge, Louisiana, though it will grow at least as far north as Memphis, Tennessee. Spanish moss in the Valley reaches about the latitude of Memphis. Palmetto goes at least as far north as southern Arkansas.

In general, there are three well-defined forest divisions to fit marked contrasts in relief and drainage in the Lower Valley. On the sandy batture, wet with floods and dry with low water, the willow is most prominent. With it are associated cottonwoods, the sweetgum, and sycamore. The higher natural levees, abandoned river bars and high islands, all not subject to lengthy inundation, support a so-called second-bottom hardwood forest, deciduous and live oaks, magnolia, hickory, pecan, beech, and cane brakes. The abundance of mast-producing species gives the second-bottom forest a richness in animal life. In the first-bottom or swamp forest occupying the most extensive areas are the bald cypress, tupelogum, swamp oak, swamp red maple, and palmetto, with festoons of Spanish moss especially in the bald cypresses.

Urban and Built-up

For almost six out of every ten persons residing in the Lower Mississippi Region, home is an urban setting - not only a place of residence, but the site of most experience. By the year 2000 - a mere 28 years - seven out of ten residents will dwell in urban areas such as Memphis, Tennessee, or New Orleans, Louisiana.

Urban areas consist of the neighborhood, cities, the metropolitan region, and urban sprawl. This usage presently consumes nearly 4 percent of the land area in the region.

Agricultural

Beyond and around the cities lie the vast expanses of rural land comprising 96 percent of the region's area, encompassing an infinite variety of lands and waters from the urban fringes to the remote wilderness of the Ouachita Mountains. Within the rural setting, quality environment derives from wise and careful husbandry that is in fundamental harmony with the land's ecosystems. Many kinds of effort are needed to retain this quality. Soil, water, and plant management must reflect the concern of stewardship for the future. But rural expanses beyond the suburbs not only provide homes and working space for those who live there; they are also the scene of much of the outdoor leisure activity of those who live in cities. The rural landscape pleases or offends the eye as one goes from city to city about his daily business or travels to a vacation spot.

Rural land is more than a backdrop for comings and goings of urban residents. It provides not only timber products, but also needed food and fiber as well as income to the producers.

Minerals

The most common type of mineral exploitation in the region is the excavation of sand and gravel. Sea shell deposits are excavated in some portions of the coastal area. Mining of sulfur and other minerals is a major operation in some parts of Louisiana. Bauxite is mined in open pits in a portion of the region in Arkansas. Rock quarries, rock outcroppings, and tar pits are found in Louisiana.

Water Bodies

General

The Lower Mississippi Region contains examples of almost all types of water forms except glacial lakes and fjords. There are waters in motion, placid waters, and other water forms. The variety and abundance of water forms in the region is a major factor in maintaining its scenic qualities and visual interest.

Mississippi River

Today, as in ages past, the Mississippi River is an awesome moving force. This force was the chief agent in shaping a major portion of the region; in modern times, it has been an important factor affecting the lives of millions of people and in helping to shape the economy and even the destiny of the entire Nation.

In 1927, during the Mississippi River flood, the New York Times published a sketch map of the streams that rise in the territory drained by the Mississippi River. That map, published in an effort to convey a clearer understanding of flood control problems in the Alluvial Valley, showed that drainage areas in 31 States and 2 Canadian provinces contribute to the flow of water in the Lower Mississippi. Approximately 1,245,000 square miles of land, about 41 percent of the Continental United States, fall within the drainage basin of the Mississippi River.

The straight line distance from the mouth of the Ohio River to the Gulf is only about 600 miles, but the river distance was approximately 1,070 miles before the Corps of Engineers began to make cutoffs to improve flood control and navigation on the river. The present length of the Lower Mississippi River is 954 miles. It averages 1,600 yards in width and its main fall is about 3 inches to a mile. There are three major segments of the Mississippi River which show transitional channel characteristics that correspond roughly with the northern, central, and southern divisions of the alluvial plain.

In the northern division above Helena, the Mississippi has a broad shallow channel with many bars and islands. The valley slope is steeper than in the downstream segments and channel changes are rapid. The channel is marked by a series of long reaches.

From Helena, Arkansas, to Angola, Louisiana, the river has a deeper and narrower channel than to the north and fewer bars and islands. The valley slope is intermediate between that of the northern and southern segments. The channel is very sinuous, meandering is rapid, and only a few reaches have developed. Most of the channel migration takes place with a regular rate and direction. Historic cutoffs have been numerous.

"Old Man River" meanders gracefully but majestically through the heartland of America

The channel in the southern segment from Angola, Louisiana, to the Gulf becomes progressively deeper and narrower southward from Angola as the valley slope gradually decreases. Channel migration is slow and growth of abnormal meanders ceases below Donaldsonville, Louisiana. The last sandbar in the Mississippi River lies just above Donaldsonville and the banks downstream are composed of progressively finer deposits.

Major Tributaries

All major tributaries except the Ohio River enter the Mississippi from the western side of the valley. The St. Francis River heads near the extreme upper end of the western portion of the Lower Mississippi Region and enters the Mississippi near Helena, Arkansas. The Black, Current, and Spring Rivers form part of the White River system which empties into the Mississippi some 50 miles straight-line distance below Helena. Then the Arkansas River, which enters the Alluvial Valley near Little Rock, Arkansas, joins the Mississippi a short distance below the mouth of the White River.

The Ouachita River enters the Alluvial Valley near Monroe, Louisiana, but the entire Ouachita River drainage area is considered part of the Lower Mississippi Region. The Red River enters the region at Alexandria, Louisiana. It flows into the Black River, which then joins with the Atchafalaya River, a major distributary of the Mississippi River.

Largest of the minor tributaries entering the Mississippi from the eastern uplands south of the Ohio River are the Obion, Forked Deer, Hatchie, Loosahatchie, and Wolf Rivers of Tennessee. The Coldwater, Tallahatchie, Yocona, and Yalobusha Rivers, the headwaters of the Yazoo System, the Big Black and Homochitto Rivers enter the valley from Mississippi.

Many minor tributary streams of the Mississippi have drainage basins which are confined wholly to the flood plain of the Alluvial Valley. The Sunflower River and the Yazoo River, which drain the Yazoo Basin, are increased by the waters from several minor upland streams. Many of the flood plain tributary streams follow abandoned channels of the Mississippi River.

Distributaries

The Mississippi River once had several distribution or flood outlets to the Gulf. All except the Atchafalaya have been closed by artificial means. This distributary heads on the western side of the Mississippi near Simmesport, Louisiana, in the Old River segment of Red River, approximately 7 miles upstream from the Red-Mississippi junction and flows 140 miles to the Gulf. The Atchafalaya follows a system of near sea level lakes for the last 80 miles to the Gulf.

Other Water Forms

Other water forms include waters in motion, such as rock-bottomed rivulets, streams, and rivers in the Ouachita Mountains portion of the region; and they include placid waters, such as innumerable sloughs and sluggish bayous of various sizes, big oxbow lakes, and that unusually large and low-lying half-water, half-land coastal marshland area. Some of the lakes that are either within or close to the marshlands are very large. The largest is Lake Pontchartrain (WRPA 10), which measures 25 miles from north to south and 40 miles from east to west.

The other water forms within the region also include man-made water areas ranging in size from huge reservoirs constructed primarily for flood control to very small, and very numerous, farm ponds. Some man-made water areas, such as navigation canals along the coast and borrow pits adjacent to levees enhance scenic qualities and visual interest.

One small water form, free flowing springs, is found in various areas of the Valley. Hot Springs National Park in Arkansas has 47 springs having medicinal qualities. In the past, sweet water springs were fairly common in most portions of the region and played a relatively important role in the lives of many people. The early settlers regarded proximity to a good free flowing spring not only as a major consideration in selecting the sites for their homes but also for selecting the sites for their churches and schools. The complete disappearance of the great majority of the springs within the last 75 years, and the alteration of the landscapes around the former locations of these springs, represents a considerable loss in scenic and aesthetic qualities within the region.

Natural Lakes

Lake Pontchartrain in WRPA 10 is the largest natural lake in the region. It covers 398,000 acres, provides high fishing and waterfowl use, and contributes to the salt-water fishing of the region. This lake is accessible to New Orleans, Louisiana, residents and is heavily used for swimming, boating, and related water oriented recreation activities, both by the people living in and those visiting the New Orleans area.

Maurepas Lake in WRPA 8 is the second largest natural lake. It joins Lake Pontchartrain and is similar in character. It covers approximately 58,200 acres and is followed in size by White Lake (51,800 acres) and Calcasieu Lake (42,900 acres) and Grand Lake (41,000 acres) in WRPA 9, and by Lake Salvador which covers 44,800 acres in WRPA 10. These large coastal lakes are all highly important to estuarine species of fish and wildlife, and all receive heavy waterfowl usage.

Elsewhere in the region, natural lakes are much smaller than the coastal lakes, and are found mostly in the form of oxbows along the

Mississippi River and its major tributaries. Most of the oxbows are scenically attractive and add to the general quality of life as well as providing recreation sites and fish and wildlife habitat.

Although the oxbows account for the bulk of the region's natural fresh-water lakes, there are also other types of lakes, such as Catahoula Lake in WRPA 5 and Reelfoot Lake in WRPA 3. Catahoula Lake exemplifies a common type of water body formed by the natural topographic and hydrologic conditions of the region. Reelfoot Lake, however, is unique and is the product of earth movements during the New Madrid earthquake of 1811-12. Additional information on these lakes and other significant natural lakes in the region can be found in Appendix D, Inventory of Facilities.

Man-made Impoundments

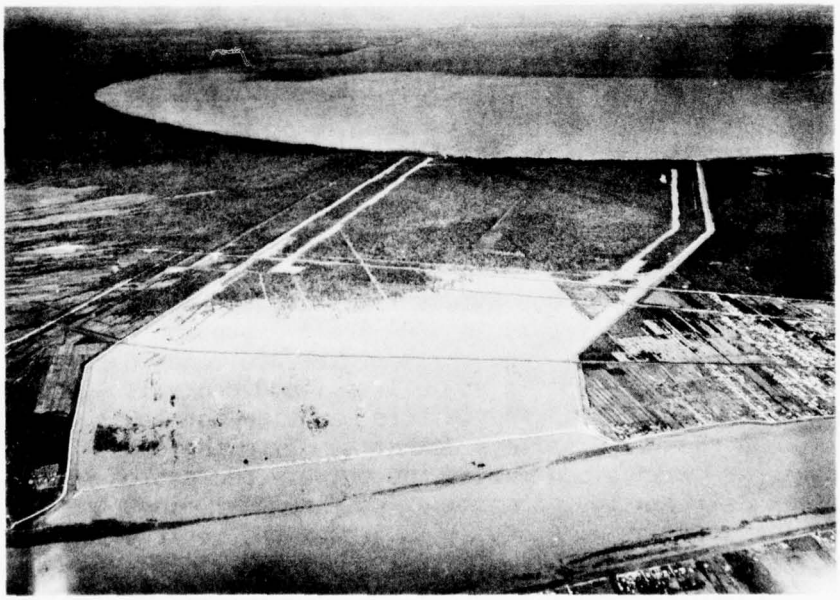
Numerous large lakes serving the primary purpose of recreation and fish and wildlife have been constructed in WRPA's 2, 3, and 5 by the States of Arkansas, Kentucky, Missouri, and Tennessee. White Oak Lake, covering 2,600 acres in the Arkansas portion of the region, is the largest lake of this type. Other State-owned Arkansas lakes in WRPA's 2 and 5 vary in size from about 300 to 600 acres. In WRPA 3, all of the State-owned lakes are generally less than 200 acres in size; the smallest is Shelby Lake, which covers about 80 acres in Kentucky.

Other than the State-owned fishing lakes, there are four lakes administered by local commissions in WRPA 5. These include Bayou D'Arbonne Lake, 15,241 acres; Corney Lake, 1,920 acres; Lake Claiborne, 6,400 acres; and Lake Winona, 5,520 acres; all of which serve the primary purpose of recreation and fish and wildlife, while adding to the environmental quality of the planning area. In addition, the Arkansas Power and Light Company administers the use of its two large reservoirs in WRPA 5 - Lake Catherine, 3,000 acres; and Lake Hamilton, 5,200 acres; for recreation and fish and wildlife purposes.

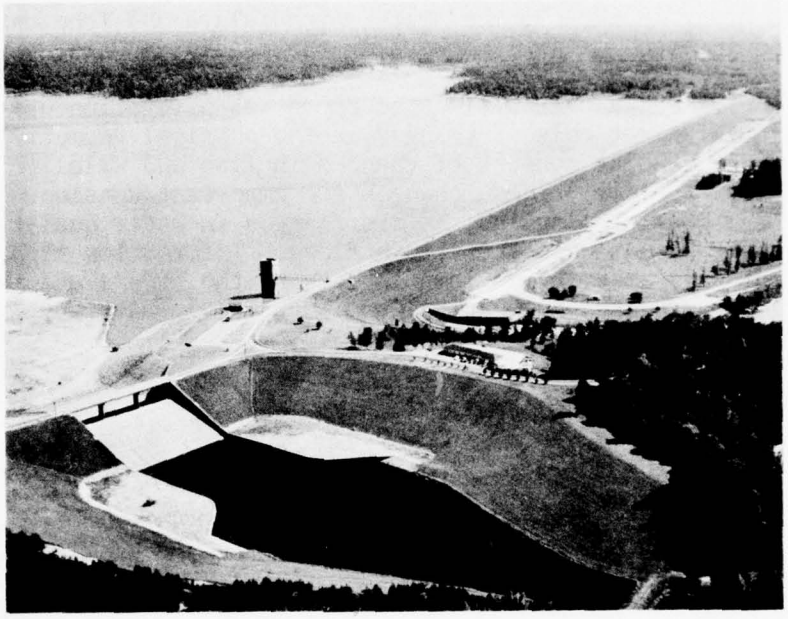
The U.S. Army Corps of Engineers has constructed several major multiple-purpose reservoirs in the region. Lake Wappapello in WRPA 2; Arkabutla, Enid, Grenada, and Sardis Lakes in WRPA 4; and Lake Greeson, Lake Ouachita, and DeGray Lake in WRPA 5 all serve the primary purpose of flood control. However, these reservoirs are managed for aesthetic and public recreation purposes as well as flood control. Overlook areas have been provided where visitors may view the lakes, dams, outlet works, and the river valleys downstream from the dams. In addition, stable pools are maintained during the primary recreation season, and public use facilities for picnicking, camping, swimming, and boating have been installed at numerous sites around the reservoirs.

In most areas of the region, except WRPA's 1, 6, 8, and 10, small reservoirs have been constructed or planned by the U.S. Soil Conservation Service under upstream watershed programs. These projects are

Within the Atchafalaya River Basin are some of the most outstanding natural areas in the entire region



Excess flood flows from the Mississippi River are passed to Lake Pontchartrain through the Bonnet Carré Spillway, shown in the foreground



Enid Lake, in WRPA 4, is one of the many Corps of Engineers multiple-purpose reservoirs in the region

primarily for flood prevention, but some are multi-purpose including provisions for recreation and fish and wildlife. In addition to the existing and planned Soil Conservation Service flood-prevention reservoirs, numerous farm ponds for livestock water or recreation (fishing) are scattered throughout the region and add to the diversity of the landscape.

Water Use

Use of the water bodies in the region varies from instream uses such as fishing, recreation, waterfowl habitat, and navigation to withdrawals for municipal and industrial water supplies, thermoelectric power generation, and irrigation. Except for commercial navigation, the instream uses generally involve little or no alteration of the natural environment. Navigation use, however, normally requires extensive alterations involving channel clearing and snagging, widening, deepening, straightening, and bank stabilization.

Such alterations have been made to varying degrees along the entire length of the Mississippi River within WRPA 1. They have also been made to varying degrees along the Arkansas and L'Anguille Rivers and Blackfish Bayou in WRPA 2; the Forked Deer, Obion, and Wolf Rivers in WRPA 3; the Yazoo River in WRPA 4; the Ouachita and Black Rivers in WRPA 5; the

Homochitto River in WRPA 7; the Amite, Atchafalaya and Tchefuncte Rivers, and numerous other waterways in the coastal WRPA's.

The environmental alterations accompanying navigation use of the waterways consist not only of changes in the physical geometry of rivers and streams; they also consist of changes in fish and wildlife habitat and ecological systems. These changes are important considerations in environmental quality planning, as are changes in water quality resulting from water withdrawals and return flows. Information regarding water withdrawals and return flows in each of the WRPA's and the region as a whole appears in the Municipal and Industrial Water Supply Appendix and other appendixes.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

The beauty of water in all its forms is legendary. The still water of the Psalmist, the fountains of Rome and Washington, D.C., the cataracts of Niagara, the roar of the surf - through history such waters have inspired innumerable works of art and poetry. For the utilitarian values of water, most of the region's major cities have been built along the rivers.

Scenic Rivers and Streams

Exploration and settlement of the region followed the Mississippi River and its tributaries. First as passageways to the interior and then as sources of power, domestic and industrial water supply, and commercial and recreational opportunity, free flowing rivers have always been fundamentally important to the growth and development of America.

Too often in the past, however, river flows have been harnessed to enhance economic growth without adequate thought for their scenic, recreation, and fish and wildlife values. Shorelines have been cleared of forest, and streams have been polluted not only by sediment washed from denuded soil, but also by waste material from municipal, industrial, and agricultural activities.

Today, a handful of tributaries remain relatively untamed or unexploited by man. Some are wilderness streams, coursing through semivirgin lands. Others flow silently, winding their way through shadowy swamps. As remnants of scenic beauty, the finest of the rivers remaining in their natural or near-natural state deserve protection.

The largest and by far the most significant river anywhere in the region is the Mississippi River in WRPA 1. This is the parent stream of practically all the region's tributaries, the hub of commercial navigation, and the ultimate conduit not only for the region's flood waters but also for its waste discharges from municipal, industrial, and agricultural sources. As such, the river has been a focal point of man's activities for the past 150 years. In the interest of navigation, its depth has been increased by dredging, its length shortened by artificial cutoffs, and its banks flattened and stabilized by articulated concrete mattresses. Similarly, it has been almost completely walled in by man-made levees for flood control. Nevertheless, the Mississippi River is still a magnificent body of water, with many acres of natural beauty and open vistas along its banks contributing to its aesthetic appeal.

Streams with bountiful hardwood bottomlands provide unmatched wildlife, fishery, and waterfowl habitat

In WRPA 2, the upper St. Francis and lower Cache Rivers both have long reaches of essentially undeveloped and scenically attractive shorelines. These attributes contribute to the environmental quality of those streams. They also contribute to the environmental quality of the Hatchie River in WRPA 3, the Big Black River in WRPA 7, several rivers and streams in the coastal WRPA's, and numerous others scattered throughout the region.

The importance of preserving the environmental quality attributes of the region's rivers and streams for the enjoyment of future generations has been recognized by the States. Louisiana, for example, has already enacted scenic rivers legislation providing for the protection of 10 streams in WRPA 5 and 14 streams in the coastal WRPA's. Similar legislation has been proposed in Mississippi.

Lakes

More and more, man depends upon lakes and reservoirs for many daily needs including power generation, flood control, industrial development, recreation, municipal water supplies, and the irrigation of crop lands. He further depends upon these water bodies for environmental variety and diversity as he seeks to fulfill his varied spiritual and psychological needs.

The lakes and reservoirs available to fulfill these needs in the Lower Mississippi Region range from small ponds, to rather large natural oxbow lakes, to very large multiple-purpose reservoirs. In WRPA 1, alone, there are more than 40,000 acres of scenically attractive oxbow lakes that provide landscape diversity and recreation sites along with excellent fishing and waterfowl habitat. Hardly any of the numerous oxbow lakes are less than 200 acres in size, while the largest covers more than 4,000 acres.

The oxbow lakes, in addition to their scenic attributes, are part of a complex ecosystem which includes not only the lakes themselves, but also the Mississippi River. The lakes serve as off-channel flood storage sites wherein temporarily stored water can help to reduce flood crests, contribute to the recharge of ground-water supplies in some areas, lose some of its turbidity, and take on organic enrichment which is transmitted to the river. The lakes also serve as nursery areas for aquatic life in the river; provide resting areas for migratory waterfowl; and can serve as study areas for education institutions interested in ecosystems whose plants, animals, fishes, amphibians, and invertebrates can be studied in their natural environment.

Aside from the natural oxbow lakes, there are in the region numerous other natural lakes whose scenic setting, sparsely developed shoreline, unique origin, or other attributes are of special interest. One such lake is Reelfoot Lake in WRPA 3. This large body of fresh water covering about 33,000 acres in west Tennessee was formed by the New Madrid earthquake of 1811-12. Today, it is regarded as one of the South's finer lakes for fresh water fishing, and its unique ecological systems contribute to the general quality of life in a variety of subtle ways.

Wetlands

The region's wetlands include flooded river bottom lands and swamps and expansive marshlands with adjoining tidal river estuaries. They can be found throughout the region in close association with stands of bottomland hardwoods, and are generally an integral part of the bottomland hardwood forest environment. Some of the most extensive and significant wetlands are those in WRPA 9 in the Atchafalaya and Morganza floodways and the Mermentau basin, and along Chenier Au Tigre.

Beaches and Shores

The encounter between man and sea offers one of the most rewarding of all human experiences. Standing at the edge of the continent confronting the ocean or Gulf, each may be his own Ulysses or Balboa.

The Delta National Forest, in WRPA 4, contains this wilderness area, which is counted among several areas that have retained many of their virgin characteristics.

The edge of the sea has special meanings for the beachcomber who walks the tideline, watching for the flotsam; for the bather who absorbs the sun's relaxing warmth; for the surfer who pits his skill against the white charging combers; for skindivers who explore undersea beauty.

Natural islands, whether surrounded by fresh or salt water, offer in addition a special sense of detachment, a memorable apartness from pressures and routine of everyday living.

Opportunities for experiencing these things are provided by the hundreds of miles of Louisiana beaches and shores in WRPA's 9 and 10 and by the off-shore islands that front the beaches. It is here alone that significant beaches can be found in the region.

Wilderness Areas

Beyond the countryside that surrounds the cities and towns lie the lands largely uninhabited or undisturbed by man. These remote mountains and forests include remnants of primeval America. Here the more expansive forest and park lands offer opportunities for memorable outdoor experiences in surroundings of superlative natural beauty.

The values that the American people attach to wilderness have steadily changed from the days when their ancestors first cleared the eastern forest. Wilderness in overwhelming abundance is an entirely different matter from wilderness grown scarce. That which is scarce is valued highly. As wilderness makes its last stand, Americans have come to appreciate the solitude, naturalness: and a small but growing minority actively pursue the wilderness experience of self-reliant living and traveling in wild areas under primitive conditions.

Wilderness is essentially undeveloped land which retains its primeval state. In the Lower Mississippi Region it is composed of majestic forests and mountainous terrain along Crowley's Ridge in WRPA 2. It is also composed of other areas along the lower Arkansas and White Rivers in WRPA 2, the Delta National Forest in WRPA 4, and the Felsenthal Basin, Dismal Swamp, Seven Devils Swamp, and the Ouachita and Kisatchie National Forests in WRPA 5. The Foster Lake area of the Buffalo River, the Grand Gulf area, and the Homochitto National Forest are wilderness areas in WRPA 7. The lower portion of the Atchafalaya Floodway below Krotz Springs, Louisiana, in WRPA 9 is the most significant wilderness area in the region.

Unique Geological Systems

The Lower Mississippi River region includes part of the Mississippi embayment, all of the Lower Mississippi River alluvial plain and delta,

part of the East and West Gulf Coastal Plain, and small areas in the Ouachita Mountains, Arkansas Valley, and Ozark Plateaus.

Overall, there are in the region a total of 45 geological systems of special interest. These include the previously mentioned Crowley's Ridge in WRPA 2 and the St. Francis Sunken Lands, also located in that planning area. They also include Reelfoot Lake and the Owl Creek Fossil Bed in WRPA 3, and the Delta Hills Bluffs in WRPA 4.

Of 16 significant geological systems in WRPA 5, the most important is probably the diamond mine in Pike County, Arkansas. Others include the Magnet Cove Crater, Winnfield Marble Rock Quarry, Masley's Bluff, and Sicily Island. The loess bluff hills in WRPA 7 are significant environmental components of that area, and there are an additional 23 significant geological systems scattered throughout the three coastal WRPA's. Needs for the preservation of these many geological components of the environment are detailed in the appropriate WRPA summaries.

Unique Ecological Systems

Among the region's environmental quality components are more than 816,000 acres of land that harbor unique ecological systems. The great majority of these lands (719,000 acres) are located in WRPA 2, which encompasses the ecological systems of the St. Francis Floodway, Crowley's Ridge, the White River batture lands, the Lower Arkansas lands, and the Grand Prairie lands. Reelfoot Lake in WRPA 3 is important not only from the standpoint of its unique geological origin, but also from the standpoint of its unique ecological system. Murphy's Pond in WRPA 3 is important also from an ecological standpoint.

In WRPA 4, unique ecological systems can be found in the Sharkey Bayou and McIntyre Lake areas, which cover, respectively, 2,500 and 400 acres. They can also be found in this planning area in the 1,000-acre Beckham Swamp and in numerous other marshy areas such as the Blue Lake and Eagle brakes. Significant ecological systems in other planning areas include Catahoula Lake and Seven Devils Swamp in WRPA 5 and the Foster Lake area of the Buffalo River in WRPA 7.

Unique Botanical Systems

Previous portions of this summary described vegetative cover and indicated there are thousands of species of plants and plant communities growing within the region. Some species of trees are so widespread that unless some especially virulent disease should strike, such as the chestnut blight that decimated the American chestnut and the Dutch elm disease which is now attacking the elms, widespread species are in little danger of extermination. On the other hand, all States in the

region have plant species which are rare or endangered. While all States have shown concern for the preservation of rare plants, few have attempted to identify them. To date, only Missouri has compiled a fairly comprehensive list with pertinent information on distribution within the State.

Of the significant plants, one of the most interesting is the extraordinarily large cypress tree in the Tennessee area of WRPA 3. Elsewhere, an unusual cypress root formation can be found in the Catahoula Lake area of WRPA 5, and there are unusual plant communities in the upland area of that WRPA. Near New Madrid, Missouri, in WRPA 2 may be found Big Oak Tree State Park, which contains several of the world's largest trees. Botanical systems of special interest are the stands of virgin cypress at Zemurray Gardens and stands of virgin pines in WRPA 8; virgin coastal marsh at Avery Island, and stands of virgin cypress-tupelo in WRPA 9; virgin swamp communities at West Bayou Gardens and stands of virgin spruce pine in WRPA 10.

The American Forestry Association Social Register of Big Trees contains several world-record trees found in the region, such as:

Florida Basswood	Hot Springs, Ark.
Southern Catalpa	Water Valley, Miss.
September Elm	Glennwood, Ark.
Coast Pignat Hickory	E. Baton Rouge Parish, La.
Southern Magnolia	Olla, La.
Chalk Maple	Polk County, Ark.
Drummond Red Maple	Puxico, Mo.
Delta Post Oak	Richland Parish, La.
Nuttall Oak	Rolling Fork, Miss.
Overcup Oak	Rolling Fork, Miss.
Loblolly Pine	Urania, La.
Water Tupelo	Kinder, La.
Water Locust	Puxico, Mo.
Bald Cypress	Sharon, Tenn.
Shining Sumac	Grenada, Miss.

Bottomland Hardwoods

Indigenous bottomland hardwoods in the low-lying marshes and swamps of the region are essential components of the wetland environment. They provide a sanctuary for many forms of wildlife and otherwise contribute to the ecological system within which they developed. But they also provide an excellent source of timber, and are rapidly disappearing from the landscape due to land clearing for agriculture and other purposes.

At present, there are approximately 10.9 million acres of bottomland hardwood forests in the region. This represents roughly 17 percent

of the region's total land area and 27 percent of its total forestry resource. The largest single stand of bottomland hardwoods is located in the Atchafalaya Floodway in WRPA 9, and covers about 555,000 acres. Other large stands occupy 378,000 acres of swamps adjacent to Lakes Maurepas and Pontchartrain in WRPA's 8 and 10 and 390,000 acres in the Bayou Bartholomew lowlands of WRPA 5.

In WRPA's 4, 7, and 10, there are large individual stands, each covering more than 260,000 acres. The smallest identified stand, only 2,000 acres in size, is located in Hornersville Marsh in WRPA 2. In addition, smaller stands ranging downward in size to less than 1 acre are scattered throughout the region.

Throughout the region, ownership and management of these bottomland hardwood forests is such that more than 4 out of every 10 acres are expected to change status within the next 50 years. Many of the smaller stands will likely disappear, while the larger stands no doubt will continue to dwindle unless positive measures to maintain them are taken.

Open and Green Space

In the cities and towns of the region, some of the urban lands owned by local government and by private commercial enterprises are essentially undeveloped natural areas (open and green space). Such areas constitute but a small fraction of the region, but their presence provides a diversity in landscape for the urban residents and enhances the general quality of life.

At present, there are 57,000 acres, or 2.4 percent of the region's urban and built-up areas, classified as open and green space. Of that amount, almost three-fourths are located in WRPA's 2 and 3.

MAJOR ENVIRONMENTAL PROBLEMS

General

The impact of a deteriorating natural environment on man's spiritual and psychological well-being cannot be measured, but it is clear that few people enjoy crowding, noise, exhaust fumes, or foul water. Mounting objections to offensive sights, odors, and sounds are more widespread than ever, and today's citizens are seeking escape from massive economic costs and other unpleasant aspects of environmental deterioration. They are also seeking a better quality of life through the preservation and enhancement of certain features of the natural environment, such as scenic rivers and streams, wilderness areas, and others.

Environmental problems facing the Lower Mississippi Region are generally the same as those facing the Nation. Among them are problems relating to population dispersion, urban-rural balance, urban congestion, etc., and from misuse of the land resource and pollution of the air and water resources. A comprehensive and detailed investigation of all such problems is not a part of this report. However, to the extent that environmental concerns are fundamental to the resource planning process, the following appraisal should help in drawing attention to the types of problems requiring consideration in plans and programs for the future use of the region's land and water resources.

Land

Urban Congestion and Decay

Twentieth-century America has known three great population displacements - first, from cities to farms; second, from farms to cities; and third, from cities to the suburbs. Three out of four Americans now live in urban environments in incorporated settlements of at least 2,500 population. Metropolitan areas, alone, are home to two of every three Americans, and the percentage is rising. In the Lower Mississippi Region, 59 percent of the population now resides in urban areas - principally Memphis, Baton Rouge, and New Orleans. Over the next 50 years, this figure is projected to increase to 76 percent.

The financial plight of the cities, including those in the Lower Mississippi Region, is well known. The influx of the poor and the exodus of the middle class and the wealthy, among other factors, have drained the major cities of many of their sources of revenue. Pressed for such revenues, many cities have bowed to pressure from developers to replace historic buildings, landmarks, distinctive architecture, and much needed urban open and green space with facilities designed to regenerate past spending patterns in urban centers.

Physical deterioration is overtaking the housing in many areas of central cities. The oldest housing traditionally filters down to the poorest families as previous occupants move to new apartments or suburban homes.

With the well-known reliance of the suburbanite on the automobile, often to commute to central business districts, many downtown and other urban centers have gradually become auto dominated. Many of the urban land-use changes now favor freeways, auto garages, and parking lots - all lavish users of valuable, dwindling space.

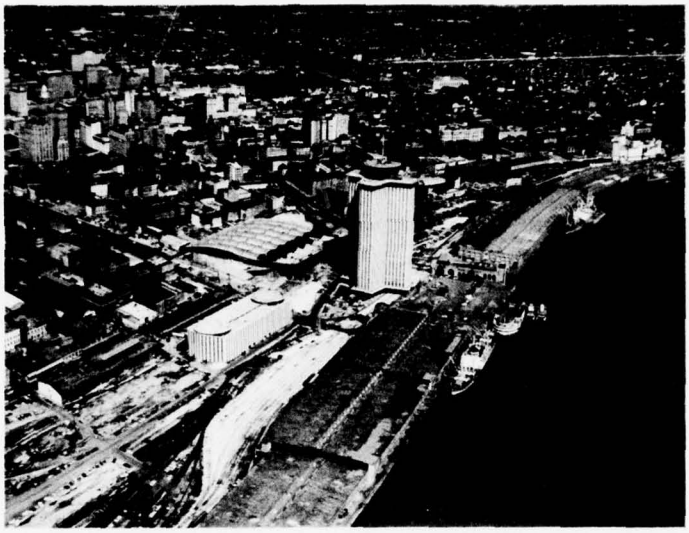
Few cities can meet the increasing need for additional park and recreational lands. Establishment and maintenance of urban open and green space have lagged behind development trends which may eventually replace all the grass with asphalt and all the trees with concrete or steel.

Although the impact of converting rural land to a developed urban or built-up area varies widely, certain effects tend to be common to this change. Open space is continually displaced by housing which, considering most present subdivision practices, provides little landscape diversity and offers each family only its individual front and backyard for outdoor enjoyment. Space is likewise diminished by other facilities required by suburban development. Shopping centers and highway interchanges, made necessary by dependence on the automobile and truck, consume large portions of land. Airports, commonly constructed in suburban or exurban areas and constantly growing in size and number, pose similar problems on an even larger scale, attracting a vast conglomeration of light industry and randomly interspersed housing. Consequently, the growing population is afforded less and less public open space.

Building and other construction practices often result in severe abuse of urban and built-up area land and are ultimately very costly to the public. The popular practice of denuding land before commencing commercial or residential construction destroys tree and plant cover and can induce heavy soil erosion. Sediment freed through erosion may fill and choke nearby streams and, ultimately, the rivers fed by the streams.

Land Drainage

Drainage of wetlands and subsequent conversion to cropland, pasture, industrial sites, or municipal areas have been and remain serious problems in the alluvial valley and tributary flood plains of the region. The problem is most acute in rural areas where drainage programs have been subsidized primarily to spur expanded agricultural enterprises. Without question, the metamorphosis of idle, undeveloped swampland into thriving cropland and associated agricultural use has been a boon to the economy of the region, thus enhancing the quality of life and social



New Orleans, the largest city in the region, endures all the complex problems of congestion in a typical large metropolitan area

Drainage of wetlands serves to reduce flood damages in adjacent cleared areas and to provide additional land for cultivation, but drainage also severely upsets or may destroy the environmental balance of an area

well-being of the people who live and work here. However, this growth and economic development was and is possible only through the sacrifice of thousands of acres of irreplaceable wetlands. Additional information may be found in Appendix L, Land Drainage.

Land Clearing

Land clearing closely attends and usually follows flood control and land drainage. Scattered, random clearing on a small scale does not seriously affect the overall balance of an area. Rather, the diversity brought about by interspersing and intermixing forests, developed areas, and agricultural operations adds a natural aesthetically pleasing character to the landscape.

However, massive clearing of thousands of acres of timber at once creates an imbalance in the ratio of natural to developed areas. Such clearing serves to disrupt the environmental tenor of a large area through wildlife displacement and habitat loss, changed runoff and natural drainage patterns, increased erosion potential, etc.

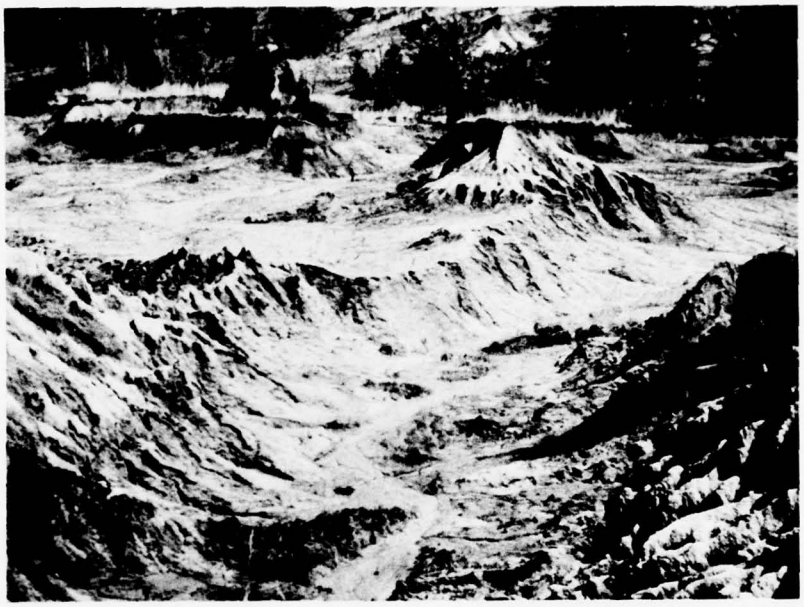
Monoculture and Lack of Diversity

The changing character of the rural environment of the Lower Mississippi Region reflects a trend towards a highly mechanized, large-scale, product-oriented food and fiber industry. In the last several decades, hundreds of small, independent farming operations have been purchased and amalgamated into sprawling agricultural enterprises oriented towards higher production efficiency through central control and management of vast acreages.

A trend towards massive agrarian monoculture has had tremendous impact upon the rural natural environment of the region, particularly in the alluvial flood plain along the Mississippi River. Stimulated in the past by Federal subsidies, land reclamation programs have transformed the region into an agricultural empire, but the beauty and viability of wetlands, lowland forests, lakes, and streams in the region have often been sacrificed as rural and urban landowners have elected, on economic grounds, to exchange their water and land resources for increased growth, prosperity, and food and fiber production.

Soil Erosion

Soil erosion is a serious problem in the Lower Mississippi Valley, particularly in the upland portions of the region. Some of the loss of valuable topsoil is caused by natural wind and water forces coupled with steep, rugged topography and loosely compacted soil. Man has also induced soil erosion through improper farming techniques, land clearing without revegetation, and drainage of wetlands. Additional information may be found in Appendix S, Sediment and Erosion.



Declines in productivity from loss of topsoil, timber damage, and stream pollution due to sediment buildup are typical results of soil erosion

Mining

Although strip mining has adversely affected many areas of the region, the problem is generally localized, randomly situated, and not demonstrable on a large scale in any one area. Abandoned mining areas, left unrestored or unstabilized, are blights on the landscape wherever they appear, and contribute to land and water pollution long after their primary usefulness for mineral production has been exhausted. Additional information may be found in Appendix G, Related Mineral Resources.

Solid Waste

Solid waste, like mining, is a localized problem of much significance, primarily near large population concentrations. Rural areas, however, also suffer from solid waste problems, principally the disposal of agricultural chemical containers which retain residual amounts of toxic substances potentially hazardous to animals, humans, soil, surface water, and ground water if absorbed in concentrated dosages. Additional information may be found in Appendix M, Health Aspects, and Appendix L, Water Quality and Pollution.

A typical result of serious water pollution is destruction of fish and other life forms which depend upon their water environment for survival

Water

General

Water resources problems in the region are, on the whole, not as critical as those of other parts of the United States. Granted, there are severe water quality problems in highly developed industrial centers, and second-order pollution plagues even small rural communities, but the region can still boast of abundant, available streams, rivers, and lakes of excellent quality.

Water Pollution

Pollution from municipal and industrial wastes and chemical-laden runoff from agricultural lands may be found throughout the region. Such problems are discussed in detail in Appendix L, Water Quality and Pollution.

Sedimentation

In both the alluvial and upland areas of the region, excessive sediment loads cause high turbidity and a generally unpleasant appearance in lakes and streams. As previously discussed, sediment pollution stems from soil erosion, both natural and man-caused. This problem is discussed in more detail in Appendix S, Sediment and Erosion.

Both natural and man-caused degradation of stream banks contribute immeasurably to sedimentation problems in the large and small waterways of the region

Flooding produces beneficial results for man in the form of soil replenishment and groundwater recharge, but the attendant destruction of property and lives may be disastrous. Flooding is beneficial to the environment through rejuvenation or purging of land-locked lakes and bottomland areas, but it also may obliterate wildlife and wildlife habitat

Flooding and Flood Plain Management

The problem of flooding and flood control is a prominent enigma in evaluating environmental problems. On one hand, flooding does immense damage to many environmental features through sheer obliteration or sediment burial. Ravaging floods destroy food supplies and many thousands of various forms of wildlife. Through sediment deposition, floods destroy timber, crops, physical property, and often human lives. Prevention of these destructive consequences of flooding is still a major, persistent problem in the Lower Mississippi Region, despite massive expenditures for various prevention and control measures.

From another viewpoint, however, limited flooding is beneficial insofar as it provides for replenishment of valuable topsoil through sediment deposition, helps to purge and rejuvenate natural and oxbow lakes located within the flood plain of a stream but severed from it, and maintains wetness conditions which are essential for growth and production in typical bottom-land ecosystems. The loss of such benefits through total elimination of flooding can have very deleterious effects upon environmental conditions in areas adjacent to streams.

In both urban and rural areas, there is widespread mismanagement of flood plains and backwater zones susceptible to inundation. Ill-conceived development in flood-prone areas inevitably gives rise to public pressure for flood protection. If such protection is provided, a cycle is thereby initiated in which further development induced by the protection results in a need for additional protection measures, and so on. The escalating process is extremely difficult to curtail or eliminate, and fertile, valuable flood plains are thus lost in the resulting sequence of events.

On the other hand, although flooding is very damaging to the environment in many ways, flood control programs and projects may be equally damaging. Construction of reservoirs in the Lower Mississippi Region has inundated thousands of acres of prime land and caused the loss of significant timber resources. Also, although more man-days of recreation opportunity have been created by impoundment construction, a proportionate loss in stream fishing and associated recreational pursuits - the values of which are not directly comparable to those of reservoirs - has resulted.

Levee construction, though excellent for confining excessive streamflows, has eliminated high-water flushing of off-stream oxbow lakes which depend upon periodic purging and rejuvenation for maintaining their productivity. Levee construction has also eliminated sediment deposition over wide areas, thus reducing the replenishment of fertile topsoil.

Stream channelization, one of the most controversial of all flood control techniques, has had tremendous impact in some areas of the Lower Mississippi Region. Loss of fishery habitat and bankside vegetation for

The beauty and productivity of many miles of streams in the region have been lost through one of the most critical environmental problems in the region--stream channelization

wildlife have reduced many thriving waterways to mere ditches, useful only for transporting high volumes of flood water and storm runoff. A more detailed discussion of this overall problem is found in Appendix E, Flood Problems, and Appendix Q, Fish and Wildlife.

Salt-Water Intrusion

Salt-water intrusion is, as expected, most prevalent in the coastal area of the region. From 1945 to 1968, the fresh/salt-water interface advanced landward 2 to 5 miles, thus causing increases in salinities in marsh ecosystems and nursery grounds. This increase in salinity has had and will continue to have dramatic impacts upon the food chain, reproductive cycles, and overall balance in the marshes and estuaries of the coastal zone. Additional information may be found in Appendix O, Coastal and Estuarine.

Salt-water intrusion is also affecting ground-water supplies in various areas. Unregulated spacing of water wells and unlimited withdrawals have depleted the aquifer storage volumes and given rise to increased chloride concentrations in several aquifers now being used as sources of both municipal and industrial water supply. Additional information may be found in Appendix C, Regional Climatology, Hydrology and Geology; Appendix K, Municipal and Industrial Water Supply; and Appendix L, Water Quality and Pollution.

Oil Pollution

Pollution from oil spills in open water is a problem both on the Mississippi River and its major tributaries as well as in the coastal estuaries and marsh areas. Oil spills are localized problems, but in the case of the coastal marshes may cause considerable damage to aquatic organisms and vegetation.

A secondary but significant problem associated with oil production is brine disposal. Serious pollution of surface and ground water at several locations in the region has occurred through accidental or willful injection of oil field brine into fresh water zones. Additional information may be found in Appendix L, Water Quality and Pollution.

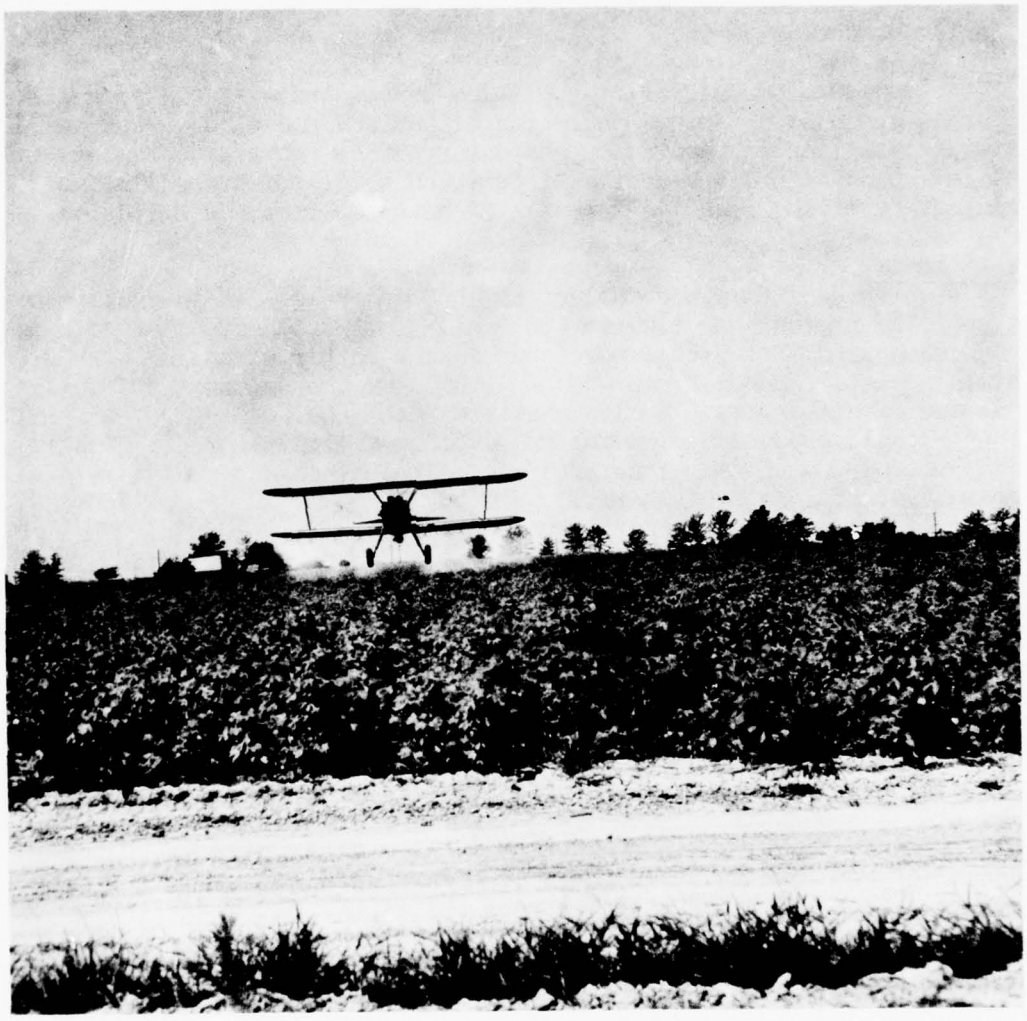
Pesticides

When Rachael Carson's "Silent Spring" was published in 1962, man's struggle to protect and reclaim the quality of his environment took on a new dimension. It became more than just a matter of coping with dirty water and air. Suddenly man was confronted by the distinct possibility that one of his apparently high achievements - the development of pesticides - could produce biological upheaval in the environment. Subtly and invisibly, a change of natural biological processes could diminish the quality of life everywhere.

Pesticides constitute a wide variety of chemical compounds used for controlling undesirable forms of life which threaten man, his possessions, and portions of the natural environment that he values. Unquestionably, pesticides used properly are, and will continue to be, of economic benefit to the inhabitants of the Lower Mississippi Region and the Nation. They have helped to produce food and protect health; they have been the front line of defense against destructive insects and rodents; and through pest control, they have provided ways for man to modify his environment to meet aesthetic and recreational demands.

However, in solving some environmental problems through the use of pesticides, man has created others of considerable magnitude through indiscriminate and uncontrolled use of these toxic substances. In several areas in the Lower Mississippi Region, lakes have been closed to commercial fishing due to excessive levels of pesticide residuals (DDT and toxaphene, primarily) in the flesh of fish and invertebrates taken from the lakes. Injection of large amounts of pesticides and other agricultural chemicals has been a prominent factor in the dramatic decline of streams and lakes adjacent to large tracts of cultivated land.

Although the full impact of pesticides on the environment is not known, evidence produced by research has brought a heightened awareness to this aspect of environmental management.



Pesticides and insecticides are essential for protecting public health and improving agricultural production, but indiscriminate, unmanaged application of toxic chemicals can seriously impact both flora and fauna

ENVIRONMENTAL NEEDS

General

In order to maintain, enhance, or restore the environmental integrity of certain natural features in the Lower Mississippi Region, resource management plans should henceforth include express provisions for protecting these selected features. Protection of these features of the natural environment will insure their availability for the enjoyment of future generations, and will also help prolong the overall stability of the region.

It may be necessary in some instances to forego potential short or long term economic gains in order not to encroach upon or degrade significant environmental features in the region, but such tangible benefits foregone may be equaled or surpassed by other intangible benefits relating moreso to the social and physical well-being of the people who inhabit the region.

The following summary supports the quantified environmental needs for the region, as shown in figure 2 and displayed in table 1.

Scenic Rivers and Streams

A gross need for 2,362 miles of free-flowing, unexploited rivers and streams has been identified. Of this, 694 miles are under protective management already or considered unlikely to change status over the planning period. A net need for 1,668 miles therefore results, and this need may be converted to acres by assuming an average stream width of 100 feet. For the purpose of providing a green belt buffer zone along the streams, a 200-ft. wide strip along each bank is included in both the gross and net needs acreages.

Lakes

A gross need for 474,251 acres in this category has been identified, and includes the water surface and varying lengths of shoreline. The buffer zones are assumed to be at least 200 feet wide, as measured away from the water's edge, and are intended to provide a natural filter for surface runoff into the lakes. They are further intended to provide wildlife cover, wetlands preservation, and public access. The net need of 40,622 acres reflects the fact that 433,629 acres may be considered under protective management at present. With very few exceptions, this net need is shoreline acreage only.

Beaches and Shores

A gross need of 1,806 miles has been identified in this category. Assuming a 200-ft. buffer zone away from the water's edge and varying allowances for erosion in several particular areas, a gross need of 176,000 acres results. Subtracting the existing supply of 519 miles (47,300 acres) yields a net need of 1,287 miles (128,700 acres).

All the land in this category is located in WRPA's 9 and 10, along the Gulf coast of Louisiana.

Wilderness Areas

The gross need for 659,000 acres, existing supply of 9,000 acres, and resulting net need for 650,000 acres in this category include land also categorized as bottomland hardwoods, geological systems and ecological systems. The fact that tracts of land or water may fulfill needs requirements in several categories further enhances their intrinsic values. The largest (though not all contiguous) concentration of wilderness, also classified bottomland hardwoods, is 555,000 acres located in WRPA 9 in Louisiana.

Wetlands

The gross need for 1,030,000 acres and net need for 719,000 acres in this category include land also categorized under bottomland hardwoods and unique botanical systems. The loss of wetlands in the region is a serious environmental problem, particularly in the alluvial portions of the valley, where agricultural interests are reclaiming low-lying flood-prone tracts for cultivation of cotton, soybeans, and rice, primarily. All the land in this needs category is in WRPA's 3 and 9.

Unique Geological Systems

Both the gross need for 863,585 acres and the net need for 634,265 acres in this category include areas categorized elsewhere as bottomland hardwoods, lakes, and some forest and pasture land. As in the wetlands grouping, some features possess multiple beneficial characteristics.

Unique Botanical Systems

The gross need for 503,399 acres and the net need for 203,160 acres in this category include land categorized elsewhere as bottomland hardwoods and other forest land (Land Resources Appendix). The area of most critical concern in this grouping is WRPA 9, in Louisiana, having a net need for 200,280 acres.

Unique Ecological Systems

Of the gross need for 816,650 acres and the net need for 536,050 acres in this category, WRPA 2, in Arkansas, has the largest net need 517,000 acres. Some land and water in this grouping are categorized elsewhere as unique geological systems, bottomland hardwoods, lakes, and a small amount in pasture (Land Resources Appendix).

Bottomland Hardwoods

One of the most critical environmental problems in the region is the loss of stands of bottomland hardwood timber. The timber cannot be replaced in kind within the lifetime of those in the present generation. A gross need for 10,850,900 acres and a net need for 4,036,000 acres have been identified. Included in the gross needs are 1,397,000 acres classified elsewhere as lake and stream buffer zones, wilderness areas, unique geological systems, unique ecological systems, and wetlands.

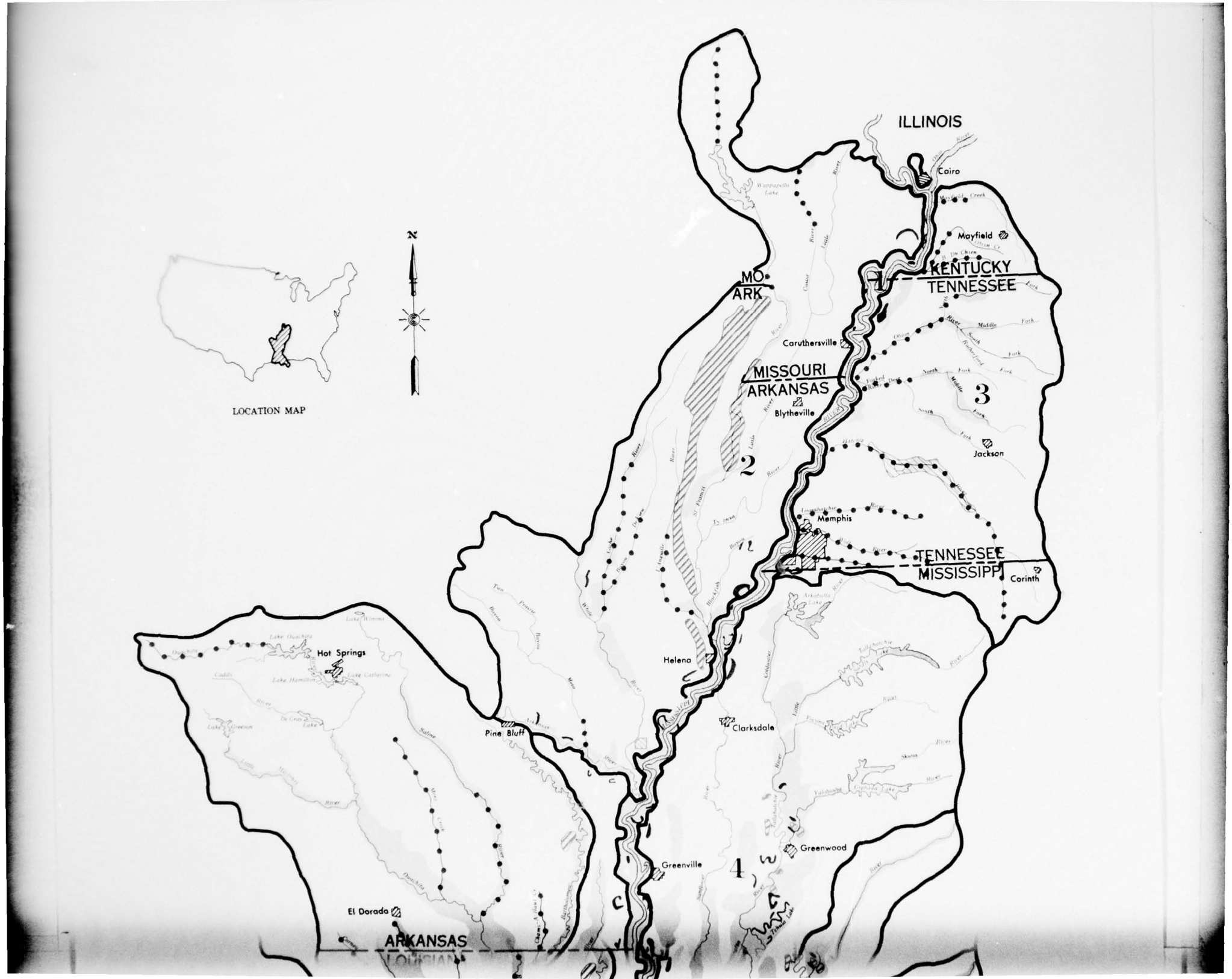
Open and Green Space

Both the gross need for 121,600 acres and net need for 108,000 acres in this category reflect requirements for urban areas only. None of the land is included in other groupings. The greatest needs for urban open and green space are in WRPA's 3, 8, and 10, where the Memphis, Baton Rouge, and New Orleans metropolitan areas are located.

Summary

The total land requirements for satisfaction of the identified environmental quality needs are embodied in a gross need for 12,404,451 acres, an existing supply of 7,331,196 acres, and a resulting net need for 5,073,255 acres. The net need is 8.1 percent of the total land area of the region.

The total identified water requirements are a gross need for 489,912 acres, an existing supply of 443,152 acres, and a resulting net need of 39,760 acres. The net need represents 3.8 percent of the total water area of the region.


LOCATION MAP
N
ILLINOIS
Cairo
Mayfield
KENTUCKY
TENNESSEE
MO.
ARK.
Caruthersville
MISSOURI
ARKANSAS
Blytheville
Jackson
Memphis
TENNESSEE
MISSISSIPPI
Corinth
Hot Springs
Helena
Pine Bluff
Clarksdale
Greenwood
Greenville
El Dorado
ARKANSAS
1
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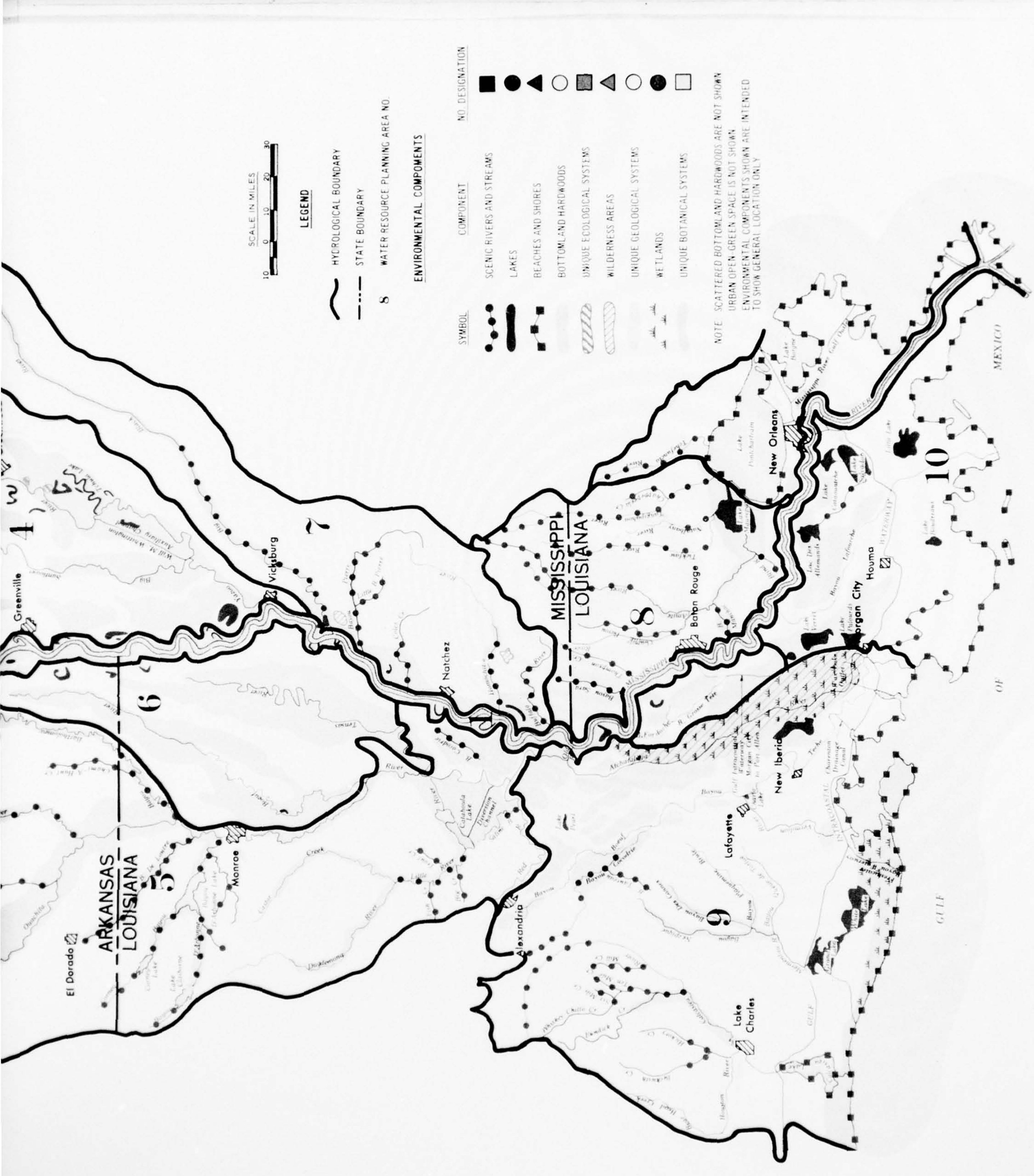


LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

FIGURE 2

TABLE 1 - SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, LOWER MISSISSIPPI REGION

Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
Scenic Rivers and Streams	Miles	(2,362)	(694)	(1,668)	Gross and net needs converted from miles to acres, using assumed average stream width of 95-ft. for water needs, and 200-ft. wide buffer strip along each side of stream for land needs.
WRPA 1		0	0	0	
WRPA 2		367	0	367	Gross and net need equals 4,228 acres of small water and 17,792 acres of land (bottomland hardwoods).
WRPA 3		571	57	514	Gross need equals 6,578 acres of small water and 27,682 acres of land (bottomland hardwoods). Net need equals 5,921 acres of small water and 24,919 acres of land.
WRPA 4		0	0	0	
WRPA 5		572	278	294	Gross need equals 6,589 acres of small water and 27,731 acres of land (bottomland hardwoods). Net need equals 3,387 acres of small water and 14,253 acres of land.
WRPA 6		0	0	0	
WRPA 7		266	0	266	Gross and net need equal 3,064 acres of small water and 12,896 acres of land (bottomland hardwoods).
WRPA 8		342	153	189	Gross need equals 3,940 acres of small water and 16,580 acres of land (bottomland hardwoods). Net need equals 2,177 acres of small water and 9,165 acres of land.
WRPA 9		179	116	63	Gross need equals 2,062 acres of small water and 8,678 acres of land (bottomland hardwoods). Net need equals 726 acres of small water and 3,054 acres of land.
WRPA 10		90	90	0	Gross need equals 1,037 acres of small water and 4,365 acres of land (bottomland hardwoods).
Lakes	Acres	(474,251)	(433,729)	(40,522)	Gross and net needs based on surface area of lake for water needs plus 200-ft. buffer strip along shore for land needs.
WRPA 1		44,732	35,196	9,536	Gross need equals 40,160 acres of large water and 5,895 acres of land (bottomland hardwoods). Net need equals 3,591 acres of large water and 5,945 acres of land.
WRPA 2		17,180	5,160	12,020	Gross need equals 6,360 acres of large water, 10,000 acres of small water and 975 acres of land (bottomland hardwoods). Net need equals 1,200 acres of large water, 10,000 acres of small water, and 975 acres of land.
WRPA 3		34,100	32,200	900	Gross need equals 33,700 acres of large water and 400 acres of land (bottomland hardwoods). Net need equals 600 acres of large water and 400 acres of land.
WRPA 4		21,623	17,153	4,470	Gross need equals 19,888 acres of large water and 1,735 acres of land (bottomland hardwoods). Net need equals 2,735 acres of large water and 1,735 acres of land.
WRPA 5		35,241	32,945	2,296	Gross need equals 33,871 acres of large water and 1,370 acres of land (bottomland hardwoods). Net need equals 926 acres of large water and 1,370 acres of land.
WRPA 6		9,285	7,980	1,305	Gross need equals 8,640 acres of large water and 645 acres of land (bottomland hardwoods). Net need equals 660 acres of large water and 645 acres of land.
WRPA 7		8,335	7,250	1,085	Gross need equals 7,750 acres of large water and 585 acres of land (bottomland hardwoods). Net need equals 500 acres of large water and 585 acres of land.
WRPA 8		61,950	61,090	860	Gross need equals 61,090 acres of large water and 860 acres of land (bottomland hardwoods). Net need equals 860 acres of land.
WRPA 9		113,440	109,950	3,490	Gross need equals 109,995 acres of large water and 3,445 acres of land (bottomland hardwoods). Net need equals 45 acres of large water and 3,445 acres of land.
WRPA 10		128,365	123,960	4,405	Gross need equals 123,960 acres of large water and 4,405 acres of land (bottomland hardwoods). Net need equals 4,405 acres of land.

TABLE 1 - SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, LOWER MISSISSIPPI REGION (CONTINUED)

Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
Beaches and Shores	Miles	(1,806)	(519)	(1,287)	Gross and net needs converted from miles to acres, using 200-ft. strip along shore with additional allowance for erosion.
WRPA 1		0	0	0	
WRPA 2		0	0	0	
WRPA 3		0	0	0	
WRPA 4		0	0	0	
WRPA 5		0	0	0	
WRPA 6		0	0	0	
WRPA 7		0	0	0	
WRPA 8		0	0	0	
WRPA 9		420	165	255	Gross need equals 16,000 acres of land. Net need equals 9,700 acres of land.
WRPA 10		1,386	354	1,032	Gross need equals 160,000 acres of land. Net need equals 119,000 acres of land.
Wilderness Areas	Acres	(659,000)	(9,000)	(650,000)	
WRPA 1		0	0	0	
WRPA 2		44,000	9,000	35,000	4,000 acres included in bottomland hardwoods component; 20,000 acres included in geological component; 20,000 included in ecological component.
WRPA 3		0	0	0	
WRPA 4		5,000	0	5,000	Included in bottomland hardwoods component.
WRPA 5		25,000	0	25,000	15,000 acres included in bottomland hardwoods component; 10,000 acres are other forests.
WRPA 6		0	0	0	
WRPA 7		30,000	0	30,000	20,000 acres included in bottomland hardwood component; 10,000 are other forests.
WRPA 8		0	0	0	
WRPA 9		555,000	0	555,000	Included in bottomland hardwoods component.
WRPA 10		0	0	0	
Wetlands	Acres	(1,030,000)	(311,000)	(719,000)	
WRPA 1		0	0	0	
WRPA 2		0	0	0	
WRPA 3		64,000	11,000	53,000	Included in bottomland hardwoods component.
WRPA 4		0	0	0	
WRPA 5		0	0	0	
WRPA 6		0	0	0	
WRPA 7		0	0	0	
WRPA 8		0	0	0	
WRPA 9		966,000	300,000	666,000	676,000 acres included in bottomland hardwoods component; 290,000 acres included in botanical systems component.
WRPA 10		0	0	0	
Unique Geological Systems	Acres	(863,585)	(229,320)	(634,265)	
WRPA 1		0	0	0	
WRPA 2		598,000	196,000	402,000	91,000 acres included in bottomland hardwoods component; 350,000 acres are other forest land; 157,000 acres are pasture.

TABLE 1 - SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, LOWER MISSISSIPPI REGION (CONTINUED)

Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
Unique Geological Systems (Cont.)					
WRPA 3		33,600	33,100	500	33,500 acres are included in lakes component; 100 acres are other lands.
WRPA 4		1,055	0	1,055	All 1,055 acres are forests other than bottomland hardwoods, and are not included in that component.
WRPA 5		21,560	0	21,560	1,560 acres are included in bottomland hardwoods component; 20,000 acres are other forest lands.
WRPA 6		0	0	0	
WRPA 7		500	0	500	Included in bottomland hardwoods component.
WRPA 8		202,950	0	202,950	1,950 acres included in bottomland hardwoods component; 200,000 acres are other forest lands; 1,000 acres are pasture.
WRPA 9		5,620	20	5,600	3,000 acres included in bottomland hardwoods component; 2,620 acres are other lands.
WRPA 10		300	200	100	Unclassified (other) lands.
Unique Botanical Systems	Acres	(503,299)	(300,239)	(203,060)	
WRPA 1		0	0	0	
WRPA 2		0	0	0	
WRPA 3		12	12	0	
WRPA 4		0	0	0	
WRPA 5		80	0	80	Included in bottomland hardwoods component.
WRPA 6		0	0	100	Urban area.
WRPA 7		0	0	0	
WRPA 8		1,851	151	1,700	1,600 acres are forest land other than bottomland hardwoods, 251 acres are other lands.
WRPA 9		500,331	300,051	200,280	331 acres are included in bottomland hardwoods component; 500,000 acres are other lands.
WRPA 10		1,025	25	1,000	All 1,025 acres are forest land other than bottomland hardwoods, and are not included in that component.
Unique Ecological Systems	Acres	(816,650)	(280,700)	(535,950)	
WRPA 1		0	0	0	
WRPA 2		719,000	202,000	517,000	598,000 acres included in geological systems component; 120,000 acres included in bottomland hardwoods component; 1,000 acres are pasture.
WRPA 3		33,600	33,200	400	Included in lakes component.
WRPA 4		9,800	0	9,800	Included in bottomland hardwoods component.
WRPA 5		51,250	45,500	5,750	21,250 acres included in bottomland hardwoods component; 30,000 acres included in lakes component.
WRPA 6		0	0	0	
WRPA 7		3,000	0	3,000	Included in bottomland hardwoods component.
WRPA 8		0	0	0	
WRPA 9		0	0	0	
WRPA 10		0	0	0	

TABLE 1 - SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, LOWER MISSISSIPPI REGION (CONTINUED)

Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
Bottomland Hardwoods	Acres	(10,850,900)	(6,814,900)	(4,036,000)	
WRPA 1		879,000	0	879,000	Gross need includes 5,995 acres in buffer zone around lakes, and 873,005 acres unassociated with other environmental quality components.
WRPA 2		1,128,000	130,000	998,000	Gross need includes 17,792 acres in buffer zone along scenic streams; 975 acres in buffer zone around lakes; 4,000 acres in wilderness areas; 91,000 acres of geologic systems; 120,000 acres of ecological systems; and 894,233 acres not associated with other environmental quality components.
WRPA 3		796,000	131,400	664,600	Gross need includes 27,682 acres in buffer zone along scenic streams; 400 acres in buffer zone around lakes; 64,000 acres in wetlands; and 703,918 acres not associated with other environmental quality components.
WRPA 4		1,147,600	947,000	200,600	Gross need includes 1,735 acres in buffer zone around lakes; 5,000 acres in wilderness areas; 9,800 acres in ecological systems; and 1,131,065 acres not associated with other environmental quality components.
WRPA 5		2,362,500	1,930,200	432,300	Gross need includes 27,731 acres in buffer zone along scenic streams; 1,370 acres in buffer zone around lakes; 15,000 acres in wilderness areas; 1,800 acres in geologic systems; 80 acres in botanical systems; 21,250 acres in ecological systems; and 2,295,509 acres not associated with other environmental quality components.
WRPA 6		756,000	609,000	147,000	Gross need includes 645 acres in buffer zone around lakes; and 755,355 acres not associated with other environmental quality components.
WRPA 7		499,800	407,300	92,500	Gross need includes 12,890 acres in buffer zone along scenic streams; 585 acres in buffer zone around lakes; 20,000 acres in wilderness areas; 500 acres in geologic systems; 3,000 acres in ecological systems; and 462,819 acres not associated with other environmental quality components.
WRPA 8		988,000	800,000	188,000	Gross need includes 16,580 acres in buffer zone along scenic streams; 860 acres in buffer zone around lakes; 2,950 acres in geologic systems; and 967,610 acres not associated with other environmental quality components.
WRPA 9		1,324,000	1,080,000	244,000	Gross need includes 8,078 acres in buffer zone along scenic streams; 3,445 acres in buffer zone around lakes; 555,000 acres in wilderness areas; 664,000 acres in wetlands; 331 acres in botanical systems; and 92,546 acres not associated with other environmental quality components.
WRPA 10		970,000	780,000	190,000	Gross need includes 4,363 acres in buffer zone along scenic streams; 4,405 acres in buffer zone around lakes; and 961,232 acres not associated with other environmental quality components.
Open and Green Spaces	Acres	(121,600)	(13,000)	(108,000)	
WRPA 1		0	0	0	
WRPA 2		8,000	7,100	900	
WRPA 3		34,000	2,900	31,100	
WRPA 4		8,000	0	8,000	
WRPA 5		13,000	0	13,000	
WRPA 6		2,500	500	2,000	
WRPA 7		1,000	0	1,000	
WRPA 8		11,500	500	11,000	
WRPA 9		12,300	1,300	11,000	
WRPA 10		31,300	1,300	30,000	

TABLE 1 - SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, LOWER MISSISSIPPI REGION (CONTINUED)

Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
Total Land, All Components	Acres	(12,404,451)	(7,331,196)	(5,073,255)	
Forest					
Bottomland Hardwood		10,850,900	6,814,900	4,036,000	
Other		593,680	155,025	438,655	
Pasture		159,000	0	159,000	
Urban		121,600	13,600	108,000	
Other		679,271	347,671	331,600	
Total Water, All Components	Acres	(482,912)	(443,252)	(39,660)	
Large Water		445,414	435,257	10,157	
Small Water		37,498	7,995	29,503	

W R P A 1

ENVIRONMENTAL SETTING

General

WRPA 1, consisting of the main stem of the Mississippi River, its batture lands and its man-made levees, is located in the Central Gulf Coast Plain in portions of seven States between Cairo, Illinois, and the Gulf of Mexico (figure 3). This planning area is comprised of approximately 1.2 million acres of land and 368,000 acres of water, which together make up 2.4 percent of the total area of the Lower Mississippi Region.

Land Forms

The largest and by far the most important land form in WRPA 1 is the gulfward sloping Mississippi River Alluvial Valley, which is practically devoid of relief except for natural and man-made levees. The natural levees on each side of the intervening channel are some 1-1/4 miles apart. The short slope from the river to the crests of these levees is perhaps a quarter of a mile in length. The crest is high enough that it is topped only by unusually high stages on the river. The back slope of these natural levees reaches the level backswamp in a distance of 2 miles or so. The greatest meander belt relief, often 20 to 25 feet, occurs where natural levee crests abruptly join the topographically lower abandoned channels or active streams. The natural levees slope away from the river at rates not often exceeding 5 feet per mile. Below Franklin, Louisiana, lies the Deltaic Plain of the river. These are the lands formed by deposition of silt through time. As the material accumulates, water bodies become shallow and intertidal mudflats develop. These soon become colonized with grasses, sedges, and rushes; and extensive tracts of deltaic marsh result. Natural levees are as much as several miles wide and reach maximum elevations of 20 to 25 feet above sea level. Artificial spoil banks are now part of the natural environment in this area.

Land Use

Approximately 879,000 acres (74 percent) of WRPA 1 are forested; this represents 3 percent of the total forest acreage in the Lower Mississippi Region.

Agricultural land used for cropland and pastureland accounts for 21 percent of the land area of WRPA 1. Approximately 188,000 acres are classified as cropland and 62,000 acres are classified as pasture.

The forests of the Mississippi River batture lands are unsurpassed for their fish, wildlife, waterfowl, timber, and other bountiful natural resources

The remaining 5 percent of WRPA 1 is used for other miscellaneous purposes. There are no urban or significant built-up lands in the planning area.

Water Bodies

Rivers and Streams

The only river in WRPA 1 is the main stem of the Lower Mississippi River between Cairo, Illinois, and the Gulf of Mexico. The unimpounded waters of this portion of the stream represent both an asset and a liability to the region. On one hand, they serve as a major navigation route to regional and national markets, a fishing resource, a contributor to productive alluvial soils in the Lower Valley, a resource base for recreation and the production of steam-electric power, a receptacle for the disposal of municipal and industrial wastes, and a source of inspiration to literary and musical artists as in the case of Mark Twain and others. Conversely, they pose a flood threat of such magnitude that national attention has been focused on the problem for more than five decades, and millions of dollars have been expended on structural improvements such as levees and floodways to reduce damages from recurring overflows.

Lake Whittington, one of some 40 "main line" oxbow lakes located in the Mississippi River batture areas (between the levees), is known for fishing excellence

Natural Lakes

Some of the best fishing and waterfowl hunting in the Lower Mississippi Region can be found in WRPA 1 in and around scenically attractive oxbow lakes. Lake Whittington, 3,600 acres, is one of the largest and most productive lakes. Others include Albemarle Lake, 563 acres; Centennial Lake, 352 acres; Chotard Lake, 980 acres; De Soto Lake, 1,525 acres; Horseshoe Lake, 1,200 acres; Lake Ferguson, 1,740 acres; Lake Lee, 1,100 acres; Old River Lake, 4,200 acres; Palmyra Lake, 1,300 acres; and Tunica Lake, 3,152 acres. While most of the oxbow lakes occur naturally, there are several that have been created through channel straightening in the interest of flood control or navigation.

HISTORICAL BACKGROUND

Land Resources

Agricultural development of the rich alluvial soils along the banks of the Mississippi River began during early Colonial times, and as early as 1790 a few American farmers in the northern end of the valley were clearing wilderness areas to cultivate corn and other crops such as cotton, wheat, tobacco, flax, and hemp. These crops were grown primarily for subsistence purposes, while commercial products consisted mostly of furs and hides from bear, buffalo, deer, fox, mink, muskrat, otter, panther, wildcat, and virtually all other fur-bearing species known on the continent. The buffalo, in addition to its commercial value, was the most extensively used game food of the pioneers.

To clear virgin stands of bottomland hardwoods in making room for agricultural development on the backslope of the natural levees was a laborious process in those days, but the pioneer spirit of the early settlers generally prevailed. It took more than spirit, however, to overcome the difficulties brought about by too much water coming too often and staying too long. The pioneers met this challenge primarily by instituting levee building programs.

The first agricultural levees were constructed in the vicinity of New Orleans, Louisiana, and by 1844 the levee system of riparian landowners was practically continuous on the west bank from below New Orleans northward to the mouth of the Arkansas River. Similarly, levees on the east bank extended from well below New Orleans to Baton Rouge and at several locations between Vicksburg and Memphis. A few years later, the States, through the Swamp Land Acts of 1849 and 1850, gained possession of all unsold swamp and overflow lands bordering upon the Mississippi River, provided that proceeds from the sale of the lands would be used to construct levees and drainage ditches. This gave added impetus to levee building and further impetus came when the Congress in 1917 authorized Federal participation in the levee building program.

Since then, the main stem of the Mississippi River below the mouth of the Ohio has been almost completely "walled in" by man-made levees. These levees form the boundary of WRPA 1 and comprise the principal land form within the planning area. They serve to isolate urban and built-up areas and extensive agricultural lands from the river, but they offer no flood protection for the batture lands which have been persistently and often unwisely cleared and farmed over the past 200 years. To quote R. W. Harrison, author of "The Alluvial Empire" (1961), . . . "Not all land clearing taking place in the Delta is advisable. Many areas are particularly suited to commercial forestry . . . Many sloughs are being drained and cleared which under ideal conditions would be left for wildlife and to aid in the preservation of ground water levels."

Water Resources

During the 17th Century exploration and 18th Century settlement of the Lower Mississippi Region, the wild and awe-inspiring Mississippi River was replete with obstacles to navigation including sandbars, powerful currents, tortuous bendways and caving banks. These attributes of the river have not been completely eliminated; but the river channel, over the past century and a half, has been extensively modified to improve its navigability and flood-carrying capacity.

The first modification, consisting only of limited snag removal for navigation purposes, was authorized by the U.S. Congress in 1824. Artificial cutoffs to improve navigation at the mouth of the Red River were made in 1831; and in 1896 Congress authorized a navigation channel on the Mississippi River 9 feet deep and 250 feet wide at low water between Cairo, Illinois, and Head of Passes. In 1928 Congress increased the previously authorized navigation width to 300 feet and authorized the expenditure of $325 million for construction of a Federal project to provide flood control in the Lower Valley. Through these repeated authorizations and subsequent legislation, the existing 9-foot navigation depth between Cairo and Baton Rouge is currently being maintained through a program of bank stabilization and dredging, and a navigation channel for oceangoing traffic is being maintained in the lower reaches of the river. In addition, the old main-stem-levee system has been strengthened and enlarged to protect overflow land bordering approximately 1,600 miles of river bank; channel cutoffs have reduced the river distance from Memphis to Baton Rouge by 170 miles, and have reduced flood stages as much as 15 feet at Arkansas City and 11 feet at Vicksburg; and more than 600 miles of the river banks have been graded and stabilized through installation of articulated concrete mattresses.

Sedimentation from bank stabilization and other improvement procedures has often added to naturally heavy sediment loads in the river, and there have been accidental spills of oil and industrial products carried by barge traffic. Such factors have tended to reduce the net value of the water resources developments, but their overall worth in terms of flood control and navigation benefits have been demonstrated time and again over the years. And even despite the channelization, levees, and pollution, the Mississippi River is still a magnificent body of water, with many acres of natural beauty and open vistas along its banks contributing to its aesthetic appeal. Too, the man-made channel cutoffs have in some cases created environmental quality resources, as in the case of the 3,152-acre Tunica Lake, which provides excellent fishing and waterfowl habitat.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in the appendix, the most significant environmental quality components of WRPA 1 consist of the oxbow lakes and the bottomland hardwoods. There are no urban and built-up areas and consequently no "open and green space" to be considered. Similarly, with the exception of the Mississippi River, there are no scenic streams or unique geologic systems, and there are no significant beaches or shores except those large tracts of bankside sand beaches which, if access is possible, are available and heavily used for recreation during low-water periods in the summer months. The only wilderness areas, wetlands, and unique botanical and ecological systems are those associated with the vast stands of bottomland hardwoods.

Lakes

There are within the confines of WRPA 1 at least 40 oxbow lakes whose scenic setting and sparsely developed shorelines are of such special value that they merit being maintained in their existing state as an inheritance for future generations. The largest of these is Raccourci (Old River) Lake, which covers 4,,200 acres and has 20 miles of sparsely developed shoreline. Others include Lake Whittington, 3,600 acres; De Soto Lake, 1,525 acres; and Tunica Lake, 3,152 acres.

These lakes, in addition to their scenic attributes, are part of a complex ecosystem which includes not only the lakes themselves, but also the river. The lakes serve as off-channel flood storage sites, wherein the temporarily stored water can help to reduce flood crests, recharge ground-water supplies, and lose some of its turbidity and take on organic enrichment which is transmitted to the main stream. The lakes can also serve as nursery areas for the aquatic life in the main stream, provide resting areas for migratory waterfowl, provide recreation sites for the people visiting the area, and serve as study areas for educational institutions interested in ecosystems whose plants, animals, fishes, amphibians, and invertebrates can be studied in their natural environment.

Bottomland Hardwoods

The 0.9 million acres of remaining bottomland hardwoods and their associated wetlands and ecological systems represent a significant natural resource of varying importance to different people. Some are only interested in the hardwoods for their commercial value as lumber

and pulp. Others view them with indifference or as unsightly breeding grounds for obnoxious vipers and mosquitos; and still others view them as a disappearing natural resource of scenic splendor and scientific interest. There are other viewpoints too but regardless of the viewpoint taken, the bottomland hardwoods are important environmental features of WRPA 1 and merit express consideration in planning for the future use of the area's water and related land resources.

Tunica Lake, better known as Tunica "Cutoff," is another outstanding large Mississippi River oxbow lake renowned for superb fishing and waterfowl hunting

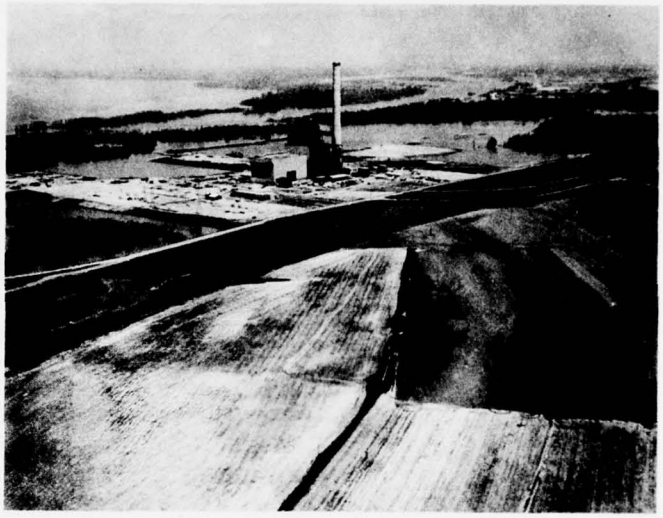
MAJOR ENVIRONMENTAL PROBLEMS

Land

The agricultural endeavors in this planning area have and can impinge upon the natural environment in a variety of insidious ways. The most obvious impingement has been the clearing of thousands of acres of virgin stands of bottomland hardwoods which contributed significantly to the natural lowland ecological systems in which they developed. Such clearing has not only eliminated ecological systems, wilderness areas, and wildlife habitat, it has also exposed the previously timbered areas to unsightly sheet erosion and flood-plain scour, and has speeded up overland runoff which has contributed to increased bank caving along the river. The loss of archeological resources through agricultural practices and other development activities is not as much a problem in WRPA 1 as it is in some of the other planning areas. Problems and needs associated with archeological and historical resources are detailed in Appendix P.

Water

Increased silt loads and turbidity in the river and oxbow lakes has resulted from development activities in and adjacent to WRPA 1, and has hastened the natural ageing process of the lakes. Nutrients from the agricultural lands have also hastened this process. In addition, pesticides and herbicides from agricultural lands have the potential for making numerous lakes unsuitable for aquatic life, while waste discharges from municipal and industrial sources have seriously degraded the quality of water in some portions of the river, reducing its fishery potential and making it unsuitable for some uses such as water contact recreation.

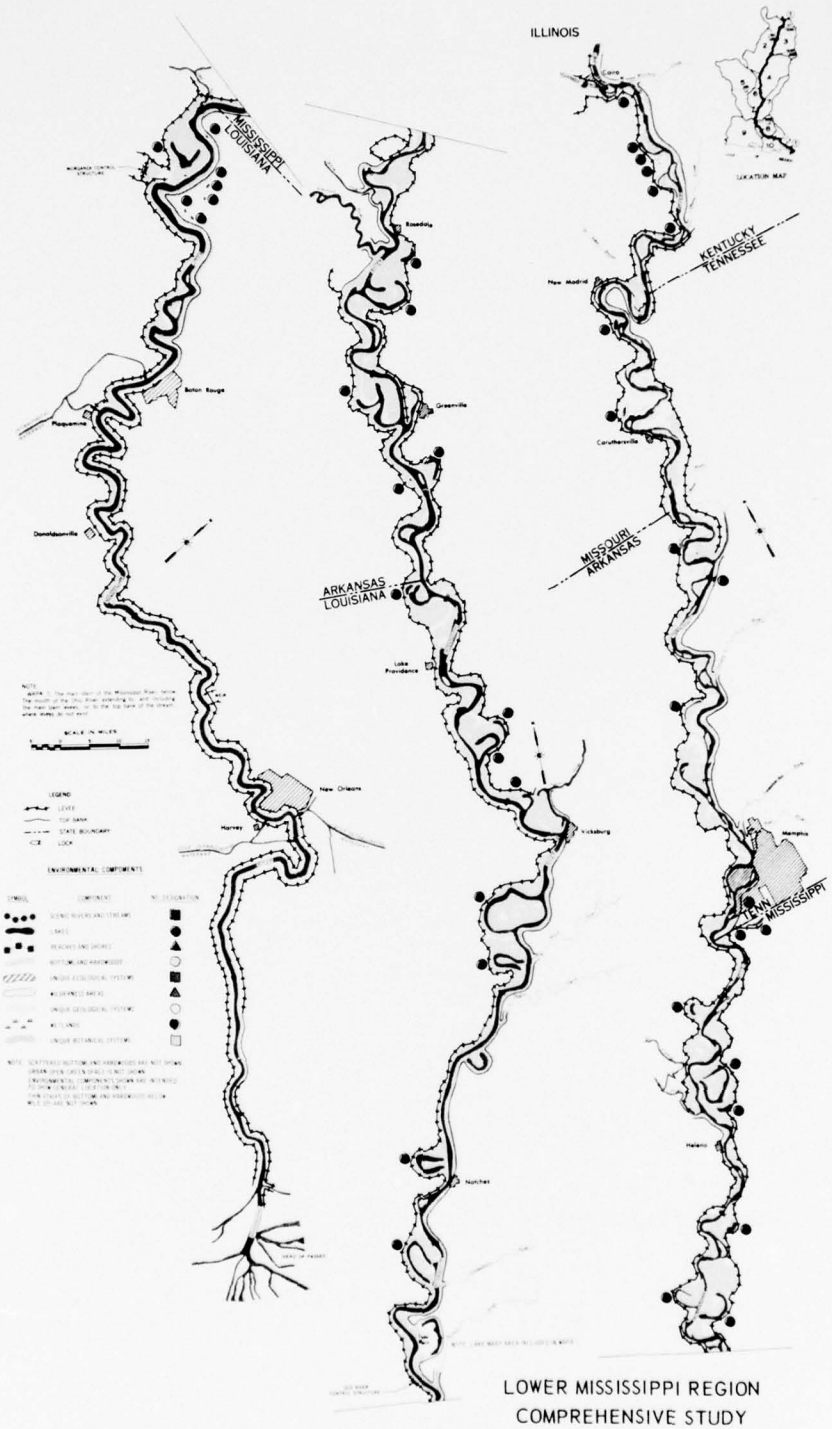


The encroachment of agriculture and industry into batture areas of the Mississippi River has resulted in an overall decline in the quality of natural water bodies and wetland areas

Municipal and industrial waste discharges have severely diminished sporting and recreational opportunities in some reaches of the Mississippi River

ENVIRONMENTAL NEEDS

Continued and uncontrolled development of the water and land resources of WRPA 1 can have irreversible effects on the natural lakes and bottomland hardwood forests. Overdevelopment of the shorelines of the lakes, for instance, can serve to destroy their natural scenic beauty which can never be retrieved. Likewise, the natural stands of bottomland hardwoods, once eliminated by agricultural or other pursuits, cannot be retrieved within the time span of human experience. Hence, there is a need for present resource users to take positive, short-term actions to preserve freedom of choice to future resource users. These actions should include by 1980 the protection of 879,000 acres of bottomland hardwoods and the protection of 40 lakes and their sparsely developed shorelines. The locations of those environmental quality resources are shown on figure 3, while needs are itemized in table 2.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 1

FIGURE 3

TABLE 2. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 1

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Streams					
	None					
	Lakes [1]	Acres [2]	(44,732)	(35,196)	(9,536)	
(1)	Birds Blue Hole	Acres	125	0	125	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
(2)	Lucas Bend	Acres	2,150	2,000	150	6 miles of sparsely developed shoreline (acquire 150 acres which is a 200-ft strip along shore).
(3)	Nowman's Blue Hole	Acres	125	0	125	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
(4)	Johnson's Blue Hole	Acres	105	0	105	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
(5)	Wolf Bayou	Acres	470	0	470	7 miles of sparsely developed shoreline (acquire 170 acres which is a 200-ft strip along shore).
(6)	Chute #7	Acres	2,475	2,400	75	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
(7)	Point Pleasant Chute	Acres	1,125	1,000	125	5 miles of sparsely developed shoreline (acquire 125 acres which is a 200-ft strip along shore).
(8)	Big Lake	Acres	500	0	500	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
(9)	Wardlows Pocket	Acres	150	0	150	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(10)	Open Lake	Acres	1,300	1,200	100	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
(11)	Bend of Island #35	Acres	625	0	625	5 miles of sparsely developed shoreline (acquire 125 acres which is a 200-ft strip along shore).
(12)	North Horn Lake	Acres	350	0	350	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
(13)	Mud Lake	Acres	250	0	250	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(14)	Horn Lake	Acres	931	856	75	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
(15)	Council Lake	Acres	900	800	100	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
(16)	Tunica Lake	Acres	3,642	3,152	490	20 miles of sparsely developed shoreline (acquire 490 acres which is a 200-ft strip along shore).
(17)	Flower Lake	Acres	1,100	1,000	100	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
(18)	Horseshoe Lake (Stovall Old River L.)	Acres	1,325	1,200	125	5 miles of sparsely developed shoreline (acquire 125 acres which is a 200-ft strip along shore).
(19)	Old River (Mellwood, Ark.)	Acres	1,200	1,000	200	8 miles of sparsely developed shoreline (acquire 200 acres which is a 200-ft strip along shore).
(20)	DeSoto Lake	Acres	1,795	1,525	270	11 miles of sparsely developed shoreline (acquire 270 Acres which is a 200-ft strip along shore).
(21)	Lake Beulah	Acres	1,110	960	150	6 miles of sparsely developed shoreline (acquire 150 acres which is a 200-ft strip along shore).
(22)	Lake Whittington	Acres	3,970	3,600	370	15 miles of sparsely developed shoreline [3] (acquire 370 acres which is a 200-ft strip along shore).
(23)	Paradise Lake	Acres	1,025	900	125	5 miles of sparsely developed shoreline (acquire 125 acres which is a 200-ft strip along shore).
(24)	Lake Lee	Acres	1,225	1,100	125	5 miles of sparsely developed shoreline (acquire 125 acres which is a 200-ft strip along shore).
(25)	Lake Port	Acres	100	0	100	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).

TABLE 2. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 1 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Lakes (continued)					
(26)	Gassoway Lake	Acres	900	800	100	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(27)	Albemarle Lake	Acres	713	563	150	6 miles of sparsely developed shoreline (acquire 150 acres which is a 200-ft strip along shore).
(28)	Chotard Lake	Acres	1,130	980	150	6 miles of sparsely developed shoreline (acquire 150 acres which is a 200-ft strip along shore).
(29)	Halpino Lake	Acres	136	0	136	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(30)	Palmyra Lake	Acres	1,760	1,300	460	19 miles of sparsely developed shoreline (acquire 460 acres which is a 200-ft strip along shore).
(31)	Yucatan Lake	Acres	2,340	2,000	340	14 miles of sparsely developed shoreline (acquire 340 acres which is a 200-ft strip along shore).
(32)	Marengo Bend (Old River North)	Acres	1,450	1,160	290	12 miles of sparsely developed shoreline (acquire 290 acres which is a 200-ft strip along shore).
(33)	Glasscock Island Lake (Old River South)	Acres	1,890	1,500	390	16 miles of sparsely developed shoreline (acquire 390 acres which is a 200-ft strip along shore).
(34)	Sugar Lake	Acres	200	0	200	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(35)	Raccourci (Old River) Lake	Acres	4,690	4,200	490	20 miles of sparsely developed shoreline (acquire 490 acres which is a 200-ft strip along shore).
(36)	Shaw Lake	Acres	200	0	200	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(37)	Ratcliff Lake	Acres	350	0	350	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(38)	Black Fork Lake	Acres	350	0	350	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(39)	Lake Platt	Acres	300	0	300	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
(40)	Pugh Lake	Acres	250	0	250	2 miles of sparsely developed shoreline (acquire 50 acres which is a 200-ft strip along shore).
	Bottomland Hardwood					
	WRPA 1	Acres	879,000	0	879,000	
	Total Land, All Components	Acres	(879,000)	0	(879,000)	
	Forests					
	Bottomland Hardwoods		879,000	0	879,000	
	Other Forests		0	0	0	
	Pasture		0	0	0	
	Urban		0	0	0	
	Other		0	0	0	
	Total Water, All Components	Acres	(40,000)	(36,400)	(3,600)	
	Large Water		40,000	36,400	3,600	
	Small Water		0	0	0	

1/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.

2/ Includes water surface and/or land area along shore.

3/ Lake Whittington has a partially developed shoreline on one side.

W R P A 2

ENVIRONMENTAL SETTING

General

WRPA 2, consisting of the St. Francis, Lower White, and Bayou Meto River Basins including the Arkansas River Basin below Pine Bluff, is located in portions of the Alluvial Valley and Ouachita Mountain Physiographic Provinces of the Central Gulf Coast Plain in southeastern Missouri and Arkansas. This planning area is comprised of approximately 10.5 million acres of land and 189,000 acres of water, which together make up 16 percent of the total area of the Lower Mississippi Region.

Land Forms

The largest and by far the most important land form within WRPA 2, and one of the most sharply defined physiographic areas of the United States, is the Mississippi River Alluvial Valley. This gulfward sloping lowland includes both the Mississippi River flood plain subject to seasonal flooding and dissected alluvial plains not completely covered by flood water. The flood plain takes up the eastern and southern portions of the planning area. The dissected alluvial plains, once a part of the flood plain, are located in the northern and western parts of the planning area. They are, for the most part, set off from the flood plain by definite escarpments. The stream valleys incised within the dissected alluvial plains are subject to backwater flooding.

The most prominent escarpment is Crowley's Ridge, a loessial upland area extending for 200 miles from Commerce, Missouri, to Helena, Arkansas. At its highest point, it attains an elevation of almost 600 feet, while the elevations of the flood plain go from about 100 feet to 300 feet. It varies from 1/2 to 12 miles in width. Its eastern slopes are relatively abrupt and are broken by steep drainage. Its western slopes are very gentle. In some places the western alopes merge so gradually with the surface of the flood plain that they are almost imperceptible.

Crowley's Ridge generally separates the Alluvial Valley into the Eastern and Western Lowlands, but there are four main water gaps by which the lowlands are connected. The most northerly and widest of the gaps is a 10-mile-wide gap that lies between Bell City and Oran, Missouri. This gap is interrupted by four small upland remnants of Crowley's Ridge. These hills, or knobs, rise 150 to 250 feet above the surface of the gap and the largest one has a surface area of only about 1 square mile. The Whitewater River flowed south between two of these hills until a few years ago when it was canalized and diverted into the

Mississippi River near Cape Girardeau. The valley of the Castor River through Crowley's Ridge is about 10 miles long, but is only from 1/2 to 1 mile wide. Castor River, before it was canalized, flowed through this gap to join the Little River near New Madrid, Missouri. The gap through which the St. Francis River flows is approximately 1 mile long and a little more than 1,000 feet wide at its narrowest portion. This gap is located near the Missouri-Arkansas line where the ridge is low and narrow. L'Anguille River flows through a 3-mile-wide gap located north of Marianna, Arkansas.

To the east of the northern end of Crowley's Ridge, the delta is cut by Sikeston Ridge, a short, narrow highland named for its principal town, Sikeston, Missouri. This ridge extends southward for 35 miles from near Commerce, Missouri, to New Madrid, Missouri. It is between 2 and 3 miles in width throughout most of its length, but flares to about 5 miles in width at its southern end. At the north end, the ridge rises 40 feet above the adjacent lowland, but descends to nearly flood plain level at New Madrid.

To the west of Crowley's Ridge, and running approximately parallel to it, is Walnut Ridge, a low and poorly defined highland. To the southwest of Crowley's Ridge is Grand Prairie Ridge, which starts at the valley wall northeast of Little Rock, Arkansas, and extends approximately 70 miles southeast to the Arkansas River at Arkansas Post, Arkansas. It averages 15 miles in width, but narrows toward the southern end. It rises 20 to 40 feet above the flood plain on a portion of its eastern side next to the White River Lowlands, but the western side next to the Arkansas River Lowlands is not so sharply defined.

The dissected alluvial plains of the planning area are bounded by foothills on the north and west. These foothills consist of an irregular, but almost continuous, line of steep bluffs broken only by the valleys of the White and Arkansas Rivers. The bluffs extend northward into the Ozark Highlands where elevations range as high as 1,770 feet above mean sea level. The rivers and streams which dissect the alluvial plains have formed natural levees along their courses. As a result, they flow between high, well-defined banks, while the bank areas are low, ill-defined, and often swampy.

The various land forms within the planning area are controlled mostly by what occurred in ages past. The sinking and rising, buckling and tilting, cooling and warming of the earth's surface and the effects of water and wind upon that surface, plus the hardness or erodibility of various portions of the earth's crust were the principal determining factors. Another important factor was the New Madrid earthquake of 1811-12, which had a great influence on the existing topography of the area. Rather than a single tremor, this earthquake consisted of a series of quakes lasting over a period of 1 year. During that period,

some land was uplifted as domes, while thousands of acres were depressed, or "sunk," and were covered with water. The St. Francis Sunk Lands, located along the St. Francis River just upstream of the mouth of the Little River, serve as but one example of nature's preeminent control over the land forms.

Land Use

Approximately 2.6 million acres (25 percent) of WRPA 2 are forested; this represents 9 percent of the forest acreage in the Lower Mississippi Region.

Agricultural land in cropland and pasture accounts for 69 percent of the land in the planning area. Approximately 6.2 million acres are classified as cropland and 1.1 million acres are classified as pasture.

Urban and built-up land accounts for 3 percent of WRPA 2, and the remaining 3 percent is in other miscellaneous uses.

Agriculture dominates land use in WRPA 2, and cropland acreage is increasing, as evidenced by clearing and burning around this soybean field

Water Bodies

Rivers and Streams

The major rivers in WRPA 2 are the St. Francis, White, and Arkansas Rivers, of which the St. Francis is the most scenically attractive. These rivers and their major tributaries are used to varying degrees for navigation, water supply, recreation, fish and wildlife and other purposes.

The St. Francis River, with a total length of 475 miles, rises in the rugged Ozark hill region of southeastern Missouri, flows through scenic terrain to Wappapello Lake, and continues southward in a winding, often deteriorating channel to the Mississippi River near Helena, Arkansas. In many locations, low water and flood flows are forced into artificial channels formed by old borrow pits. Between Wappapello Lake and Crowley's Ridge it flows through a leveed floodway and a combination natural-artificial channel complex to its mouth. The principal tributaries of the St. Francis River are (1) the Little River, which drains the attractive Castor River Basin, and (2) the L'Anguille River.

The L'Anguille River rises on Crowley's Ridge near Jonesboro, Arkansas, and flows southeasterly for 107 miles to join the St. Francis River about 17 miles upstream from the Mississippi River. The upper 21 miles of this stream are developed as an artificial channel, while the lower 86 miles of natural channel follow a twisting course through a timbered flood plain up to 1.5 miles wide. Most of the lower 50 miles of this stream are noted for their scenic beauty. Both the L'Anguille and St. Francis Rivers have in years past been cleared of snags and similar obstructions to navigation. However, neither stream is currently maintained for that purpose and there is no commerce on them, except for the limited movement of logs from point to point on the St. Francis. A flood control project, including a closure with gravity outlets and a pumping plant, is under construction near the mouth of the St. Francis and will prohibit navigation between that river and the Mississippi River.

The White River below Peach Orchard Bluff near Georgetown, Arkansas, traverses a distance of 169 miles in WRPA 2. The natural channel in this reach of the river has been modified to provide a navigation channel with a minimum depth of 8 feet and a width of 125 feet. Commerce through this channel has recently been quite active, more than doubling within the past decade.

The largest tributary of the White River is the Cache River, which rises in Butler County, Missouri, and flows southwesterly 213 miles to enter the White River just above Clarendon, Arkansas. Above Pitts, Arkansas, the natural channel has been replaced by straightened artificial channels, below that point the river follows a sinuous course through a timbered flood plain that is being cleared.

Many outstanding oxbow lakes and extensive wetlands may be found in the basin of the Cache River, shown here at its confluence with the White River

Bayou De View, principal tributary to the Cache River, originates in Crowley's Ridge near Jonesboro, Arkansas, and flows southward, entering the Cache River about 10 miles above its mouth. It too, in its upper reaches, has been developed as an artificial channel. In its lower reaches, the channel is poorly defined, but its many disconnected pools and swales are of scenic interest.

Like the White River, the Arkansas River in WRPA 2 is a navigable stream and its natural channel has been modified to improve navigation conditions. A completed navigation project provides for a channel 9 feet deep and 250 feet wide, beginning in the Mississippi River at the mouth of the White River, then 10 miles upstream in the White River to the mouth of Wild Goose Bayou, then 9 miles by an artificial canal to Arkansas Post on the Arkansas River, then along the channel of the Arkansas River, past Pine Bluff, and the boundary of WRPA 2. Below Pine Bluff, there are four navigation locks.

The principal tributary of the Arkansas River in WRPA 2 is the Bayou Meto, whose upper portion lies in the rough and hilly eastern limits of the Ozark uplift. The more extensive lower portion of the stream is in the broad alluvial valley of the Arkansas River, which merges with that of the Mississippi River flood plain well upstream from the mouth of the bayou. The lower 20 miles of the Bayou Meto are counted among the scenic rivers and streams of the planning area.

Natural Lakes

Big Lake, located in Mississippi County, Arkansas, is the largest natural lake in WRPA 2. It covers approximately 6,500 acres and provides good fishing and waterfowl habitat. Other natural lakes, of which five are noted for their scenic setting, range downward in size to less than 400 acres.

Man-made Impoundments

Several large lakes serving the primary purposes of recreation and fish and wildlife, while adding to the environmental quality of the WRPA, have been constructed throughout the planning area by the States of Missouri and Arkansas. These include: Hallowell Lake, 600 acres; Lake Des Arc, 300 acres; Lake Greenlee, 300 acres; Lake Poinsett, 550 acres; Mallard Lake, 300 acres; and Tywappity Community Lake, 120 acres. Additional information on these lakes can be found in Appendix D, Inventory of Facilities; and information on fish and wildlife needs can be found in Appendix Q, Fish and Wildlife.

The U.S. Army Corps of Engineers has constructed one major multiple-purpose reservoir in WRPA 2. Lake Wappapello on the St. Francis River serves the primary purpose of flood control. This reservoir was completed in 1941 and has since been managed for public recreation as well as flood control. Overlook areas have been provided at the dam where visitors may view the lake, the dam, the outlet works, and the river valley downstream from the dam. In addition, a minimum pool of 7,250 acres is maintained during the primary recreation season, and public use facilities for picnicking, camping, swimming, and boating have been installed at numerous sites around the reservoir. These facilities both add to and detract from the environmental quality of the area since the appearance of the lake, which appeals to many people, and the capability of the impoundment to meet recreational needs were possible only through the sacrifice of a portion of a very scenic and productive stream.

There are a number of small reservoir projects being planned by the U.S. Soil Conservation Service under upstream watershed programs in WRPA 2. These projects are primarily for flood prevention, but some are multiple-purpose including provisions for recreation. In addition to the planned Soil Conservation Service flood prevention reservoirs, numerous farm ponds for livestock water or recreation (fishing) have been constructed in the WRPA and add to the diversity of the landscape.

HISTORICAL BACKGROUND

Land Resources

The environmental base of the hills area of WRPA 2 consists primarily of mixed pine - upland hardwood timber. With the exception of relatively narrow bottomlands, the soils and topography of the uplands have never been conducive to crop production. As a result, most of the area has remained in forests. Forest management, however, has left much to be desired. In the early 1900's large amounts of pine forests were completely clear-cut, no reforestation practices were implemented, and subsequent attempts were made to farm and graze the uplands. Consequently, much of the pine forest was replaced by oak and other hardwood species. The forests of the area have been subjected to heavy grazing and frequent fire, to the extent that much of the forest land is in relatively poor hydrologic condition. These conditions have been improving somewhat over the past number of years due to the acquisition of forest lands by the U.S. Forest Service, improved fire protection, and the relatively slow process of educating private landowners.

Development in the southeast Missouri lowlands area of the WRPA has historically been centered around land reclamation. Drainage patterns of the Whitewater, Castor, Little, and St. Francis Rivers have been considerably altered by land reclamation endeavors since the early 1900's. Nearly all stream channels have been altered and straightened and the entire area is covered by an extensive system of drainage ditches. Attempts to raise crops on portions of Crowley's Ridge have caused severe erosion problems on the ridge and aggravated siltation problems in the lowlands adjacent to the ridge. In general, intensive agricultural utilization of the southeast Missouri lowlands has been carried on to the extent that little remains of the natural environment.

Prior to settlement the uplands were inhabited by the Osage Indians. The first white settlers in the uplands were French and were interested primarily in the mineral resources in the area. Lead mining operations were begun about the year 1725 in the northern portion of WRPA 2. The first settlers from the United States began to arrive in about the year 1800, with the first counties being formed in 1818. Generally, there has been an insignificant amount of the uplands cleared for agricultural purposes. In most instances where hill lands were cleared, the farmers were unable to sustain themselves for any extended period of time, and most hill lands have since reverted to forest land.

In the early 1900's most timber of value was harvested by large timber companies who then moved on, leaving the forest practically denuded of merchantable timber. At that time, pine was the predominant timber species in the area. Large tracts of pine were completely clear-cut and left with no reforestation practices applied; this resulted in

large areas which were originally occupied by virgin pine being taken over by young oak and other hardwood species. Subsequent to the establishment of the Clark National Forest in the year 1934, the National Forest Service has been engaged in a program of forest improvement. Pine is being reestablished in many areas from which the species had once disappeared as a result of timber cutting operations. The National Forest Service was also the first governmental agency with the responsibility for forest fire control, and has been instrumental in greatly reducing the number of acres of forest land which were burned over annually.

In 1937 the Missouri Constitution was amended to organize the Missouri Conservation Commission, which is charged with the protection of the fish, game, and forest resources in the State of Missouri. The Conservation Commission has been instrumental in encouraging proper timber management practices and provides fire control for those forest areas outside the jurisdiction of the National Forest Service. The efforts of the National Forest Service and the Missouri Conservation Commission are, through a combined program of education and fire control and regulation, effecting a considerable improvement in the condition of the forest lands of the area.

Over the past number of years, in areas to the west of WRPA 2, significant amounts of forest lands have been lost by spraying and conversion to pasturelands. To date this practice has been minimal in the upper regions of WRPA 2, but the possibility exists that this practice will become more prevalent in the area in the future.

The settlement and the development of the southeast Missouri lowlands area of the WRPA have a long and fascinating history, and have been responsible for one of the most drastic examples of man-induced ecological changes in the United States. The earliest known inhabitants of the Missouri lowlands area were the mound builders. According to accounts of De Soto's explorations in the Lower Mississippi River Region in 1541, these Indians possessed a relatively high degree of civilization. There are evidences of artificial canals constructed by them which connected lakes and bayous with the Mississippi River, forming an inland navigation system. They sustained themselves through agriculture, supplemented by hunting and fishing.

The earliest white settlers of the bottom lands were French fur traders, who established a trading post on the Mississippi River around 1786 or 1787 while the area was under Spanish control. The first town was established in the year 1789, near the present location of the community of New Madrid. The United States acquired possession of the area in the year 1803 by the Louisiana Purchase. Organization of counties began with New Madrid County in 1813 and county organization continued through 1851.

The early settlement and development of the area was considerably retarded by the New Madrid earthquake, with a series of shocks occurring between December 16, 1811, and December 12, 1812. This was the most severe earthquake ever recorded in the United States and was responsible in itself for major changes in the ecosystem of the area. According to eye-witness reports, undulations or waves approximately 5 feet high moved across the ground, causing considerable cracking or fissuring along the surface. Lands were uplifted, forming domes 15 to 20 feet high. Likewise, lands subsided as much as 15 to 20 feet, forming the St. Francis "sunk lands" and other phenomena. In areas of fissuring, sand and water were extruded from beneath the surface, causing numerous "sand blows" and "sand scatters." In some instances these sand extrusions deposited a layer of sand on the topsoil which killed all vegetation and made the land unproductive. It has been estimated that approximately 80,000 acres of forest land within WRPA 2 were destroyed by the uplifting of wetland species to dry positions and the submergence of dryland species. Many of the settlers of the area were discouraged by the earthquake and relocated to other parts of the country. Perhaps the most striking example of this was the community of Little Prairie, located near the present town of Caruthersville, which was completely deserted except for one family.

Within a few years after the earthquake the rate of settlement of the area again resumed what might be considered as normal proportions. The economy was strictly agricultural and such lands as were dry enough were cleared for farmsteads. Little was done prior to the last half of the 1800's in the reclamation of wetlands. In 1850, by an act of the United States Congress, swamp and overflowed lands were donated to the respective States in which they were situated. The stated purpose of this legislation was "to enable the various states to construct the necessary drains and levees to reclaim the same." It was, however, the general belief at the time that the real purpose for this legislation was to free the Federal Government of what was then considered worthless land which was a liability to whomever was the owner. The Missouri Legislature, not to be outdone by the beneficence of the United States Congress, almost immediately conveyed the title of the lands received to the various counties in which they were situated except for those in the extreme southeast part of Missouri. In 1852 the Missouri Legislature adopted a bill that donated the swamp and overflowed lands in southeast Missouri to the respective counties. In 1857 the Legislature repealed both of the previous acts and reenacted a law providing that all swamp and overflowed lands received by the Congressional Act of 1850 should "be and they are hereby declared to vest in full title and belong to the counties in which they may be." That there was in all probability considerable opposition from the counties involved to the acceptance of these lands is evidenced in that the Legislature revised the law in 1868 to read that "all of said lands in this State are hereby donated to the counties in which they may be respectively situated and shall be the absolute property of such county for the purpose herein designated."

The purpose designated was for drainage. The fact that these lands were considered worthless was evidenced by the fact that as the counties attempted to dispose of the land they found few buyers and those lands which were sold brought only a few cents per acre. One tract of 80,000 acres in Stoddard County, for example, sold for $663.95 in 1868 at public sale. Insignificant prices such as these prompted the Missouri Legislature to pass a law in 1874 limiting the minimum price for the sale of such lands to $1.25 per acre. This had the effect of retarding the sale of these lands and a significant portion remained in the possession of counties for a number of years.

Reclamation of the wetlands under provisions of the Missouri Drainage and Levee Laws, as amended in 1911, permitted the organization of Circuit and County Court Drainage and Levee Districts. Land drainage and clearing then began in earnest in the southeast Missouri lowlands. The swamp and overflowed lands were generally considered to be detrimental to the area in every respect. Not only did they restrict the development of lands for agricultural purposes, but they were barriers to the building of roads and railroads and presented a considerable health problem to the residents of the area in that they were a breeding place for the malaria-carrying anopheles mosquito. The cost of quinine consumed by the local residents to combat malaria was said to have almost equaled the amount they paid for flour. The prevailing attitude of that era toward land drainage and reclamation can be summed up in the following quotation from a report prepared in 1912 for the Missouri General Assembly. "It will be seen that every unselfish citizen from Missouri should be interested in the reclamation of our wetlands because of the bearing it will have on the public health. This work, when completed, will result in the increase of the average length of life of our people, prevent much suffering, prove a financial saving and make it possible for the inhabitants to perform more work."

An example of the economic returns realized in the early 1900's from the drainage and clearing of wetlands is that of the escalation of land values in and around the Little River Drainage District. Before the district was organized, timbered lands within the area were selling for from $3 to $10 per acre. Immediately upon the organization of the district, the land values escalated to from $20 to $40 per acre and after the lands were cleared and drained the values rose to from $75 to $125 per acre, which is an increase in land values of over tenfold. At that time, the cost of reclamation was in the range of $3 to $6 per acre. It is little wonder that the economic returns of land reclamation, combined with the prevailing attitudes toward the worthlessness of unreclaimed lands, prompted the residents of this area to proceed with drainage and clearing as rapidly as possible. Little, if any, thought was given to the preservation of areas in their natural condition. Prior to initiation of land reclamation measures, there were approximately 2.3 million acres of swamp and overflowed lands in southeast Missouri and the goal was to place the maximum amount possible of this acreage into agricultural production.

Among the hardships faced in the settlement and development of the area was that of periodic flooding of the Mississippi River and tributaries. In 1879 the Mississippi River Commission was created to strengthen the Federal efforts in flood control in the Lower Mississippi River Basin. The initial recommendations of the Commission were for a system of levees which it was thought would contain Mississippi River floods. Initial levee standards were published in 1882 and revised in 1896. The levees resulting from the 1896 standards proved to be inadequate during the flood of 1912, which caused more damage in southeast Missouri than any other previous flood. New levee standards were published in 1914 establishing a new levee cross section of increased height and base width. The resulting levee, however, proved to be inadequate during the flood of 1927. Following this flood, the concept of "levees only" for flood protection was discarded in favor of new concepts involving reservoirs, floodways, bendway cutoffs, bank stabilization, and other structural measures to supplement the levee system.

Drainage programs were given an initial impetus in 1944 with the passing of Public Law 534 which expanded the Federal concept of flood control to include "major drainage projects and improvements." The subsequent Corps of Engineers involvement in drainage programs has accelerated drainage of lands in southeast Missouri.

One of the major problems from the standpoint of preservation of the natural environment is the cycle created by flood control, drainage, and clearing. When flood control and drainage projects are implemented in order to stabilize agricultural production on marginal lands, additional lands which were formerly submarginal then become marginal and are cleared and put into production. After a few years additional measures are requested in order to stabilize production on these new marginal lands. If additional flood protection and drainage are afforded lower lying lands then become marginal, are cleared, and the process starts all over again. Clearing operations have been responsible for the loss of approximately 100,000 acres of forest land in the area over the past 10 years.

The earliest industry in the uplands of the Missouri portion of WRPA 2 was the mining and the processing of lead, copper, and iron ores. The mines were predominantly of the shaft type and relatively few acres of land were disturbed. Small communities sprang up in the vicinity of the mines to provide housing and services to those employed in the mining activity. As settlement of the area increased and agriculture was added to the economic base, additional communities providing goods and services to the agricultural sector were founded. Environmental problems associated with municipal and industrial development have been relatively minor.

Historically, the economic base of the southeast Missouri lowlands has been, and still is, almost exclusively agricultural. Communities

in the area have existed for the primary purpose of providing goods and services to agriculture. In recent years, several communities have established industrial parks and are obtaining increased diversity in industry.

There are no large cities in the southeast Missouri lowlands. The largest city in the lowlands area is Sikeston with a 1970 population of 14,699. Due to the flat nature of the topography, a substantial portion of many communities is subject to flooding. However, flood control works have been primarily for the protection of agricultural lands, and none have been constructed specifically for the protection of the communities of the area. While there are problems of a localized nature in waste disposal, etc., municipal and industrial development as such has not caused significant environmental problems.

Water Resources

Agricultural development has had a relatively minimal impact upon the typically clear and generally swift flowing streams of the uplands. Agricultural utilization of the waters of the upland streams have been almost exclusively for livestock watering. Structural measures on upland streams above Lake Wappapello include isolated small, private levees and some channelization for flood control and drainage. Lake Wappapello is located on the St. Francis River in Wayne County, Missouri, just upstream from the escarpment dividing the uplands from the lowlands. The project was constructed for the protection of agricultural lands in the lowlands, was authorized by the Flood Control Act of 1936, constructed by the Corps of Engineers, and placed in operation in June 1941. Its overall designed effectiveness is dependent upon downstream levees and other flood control works in the lowlands, some of which are not as yet under construction. The conservation pool has an area of 4,100 acres and the flood control pool, when filled, an area of 23,000 acres.

The extremely complex hydrologic system of the southeast Missouri lowlands originally consisted of a network of streams, oxbow lakes, and wetlands. The stream regime within that system has been almost completely altered by the reclamation of wetlands for agriculture. This work began in earnest shortly after the turn of the century with the organization of numerous levee and drainage districts under State law. The most significant alteration has been that of the Little River system by the Little River Drainage District, the largest district of its kind in the State of Missouri. Initially a diversion channel was constructed to divert the waters of the Castor and Whitewater Rivers, which were originally a part of the Little River system, into the Mississippi River at Cape Girardeau. The channel of Little River itself was enlarged and straightened from the vicinity of the headwater diversion to the Missouri-Arkansas State line. An extensive system of drainage ditches feeds the runoff from the Little River drainage system

into the main ditches or straightened channel. At present, approximately 757,000 acres of land are drained by the Little River system. The remainder of the lowlands, while not served by systems as extensive as the Little River system, are entirely included in levee and drainage districts, some under county and some under circuit court jurisdiction. In many areas, drainage districts overlap, causing some confusion as to district responsibilities.

The Corps of Engineers St. Francis River Basin Project authorized in 1936, of which Wappapello Reservoir is a part, provides for levees on both sides of the river below Wappapello Dam and channel straightening of the main stem and a number of tributaries. As of 1972, construction had been completed on most of the elements of the project with the exception of the channel work and the west bank levee between Wappapello Dam and Crowley's Ridge.

The Flood Control Act of 1950 authorized improvements in the Little River Basin including enlargement and extension of the upper 14 miles of the Little River headwater diversion levee and improvement of several ditches in the Little River Drainage District. As of 1972 the project was approximately 50 percent complete. In 1928 the Birds Point-New Madrid Floodway was authorized by Congress. This floodway consists of a "fuse plug" in the west bank Mississippi River levee across from the city of Cairo, Illinois, and a setback levee running from just above the fuse plug to the vicinity of New Madrid. The floodway was to be placed in operation by the blowing of the fuse plug when Mississippi River stages became high enough to threaten the city of Cairo, Illinois. The only time this floodway has been placed in operation was during the 1937 flood. Subsequent to that flood, levees protecting Cairo have been raised. This factor, associated with increased land values within the floodway, makes it doubtful as to whether the floodway will be used in the future.

Municipal and industrial development to date has had a minor effect on the streams of the uplands of the Missouri portion of WRPA 2. Water quality problems resulting from municipal and industrial discharges are minimal, there are no municipal or industrial water supplies using surface water as a source, and no protective works have been constructed as a result of municipal and industrial development.

With the exception of relatively minor and localized problems associated with municipal waste discharges, the water resources of the southeast Missouri lowlands have been affected very little by municipal and industrial development. This type of development has occurred in the lowlands primarily as a result of land reclamation practices implemented for the benefit of agriculture. There are no municipalities or industries utilizing surface water as a water supply source and, as in the case of the uplands, no protection works have been constructed for the benefit of this type of development.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in this appendix, the most significant environmental quality component of WRPA 2 is Crowley's Ridge. This land form, in addition to its unique geological character, offers a variety of environmental features including potential sites for scenic lakes, as well as existing ecological systems and wilderness areas. Scenic rivers and lakes and stands of bottomland hardwoods are scattered throughout the area, and several wilderness areas and unique ecological systems have been identified. However, there are no outstanding botanical systems and only insignificant amounts of open and green space associated with urban and built-up areas. Because of the inland setting of the WRPA, there are no significant beaches or shores. Wetlands are generally limited to those related to bottomland hardwood areas.

Scenic Rivers and Streams

The upper St. Francis, above Lake Wappapello, and the lower Cache Rivers both have long reaches of essentially undeveloped and scenically attractive shorelines of such value as to merit maintenance in their current state. In addition to these long free-flowing reaches, there are similar, but shorter, reaches along the Castor and L'Anguille Rivers and along Bayou De Vieu and Bayou Meto. The 17-mile-long Wilhelmina Cutoff in the lower reach of the St. Francis River likewise merits consideration in planning for the preservation of environmental quality in WRPA 2.

Overall, the St. Francis River above Lake Wappapello is perhaps the best example of a scenic river in the uplands area of the WRPA. The St. Francis River in this reach is typical of south Missouri Ozark streams, with a relatively high spring-fed base flow meandering through a relatively narrow valley with rugged forest-covered hills on either side. The streambed is rocky and gravelly and the water is clear and of excellent quality. The average flow at Patterson is 1,077 cubic feet per second with the minimum discharge of record of 8 cubic feet per second and the maximum discharge of 79,200 cubic feet per second. The stream gradient in this reach averages 1.8 feet per mile.

In the southeast Missouri lowlands, the most significant scenic river is the Castor River between the headwater diversion and a point just below Cline's Island, Missouri. The surrounding environment has been drastically altered, but the river itself has been left in its original channel. The Castor River in this reach is a sluggish stream meandering through lands which are almost completely cleared and

Big Robe Lake is typical of the many small but highly productive natural oxbow lakes in the lower Cache River Basin

intensively farmed. Throughout most of this reach the stream banks are covered with weeds and provide a diverse habitat for many species of wild animals, with a thin screening of timber in short reaches. In most instances fields are cultivated up to the river banks. The average flow of the Castor River, at Aquilla, is 150 cubic feet per second, with the minimum flow of record being zero and the maximum flow of record being 5,900 cubic feet per second. The Castor River in this reach functions primarily as a drainage ditch, carrying appreciable volumes of flow during wet seasons and very little flow during dry periods. The gradient of the Castor River throughout this reach averages 0.8 feet per mile.

Lakes

Within the hydrologic boundary of WRPA 2, there are at least eight natural lakes whose scenic setting and sparsely developed shorelines are of such special value that they merit being maintained in their existing state as an inheritance for future generations. The largest of these is Horseshoe Lake, which covers 2,500 acres in Crittenden County, near Hughes, Arkansas. Others, ranging in size from 350 to 800 or more acres, include Ten Mile Pond in Mississippi County, Missouri; East Lake located southeast of Clarendon, Arkansas; Swan Lake and Hannaberry Lake in Jefferson County, Arkansas; Blackfish Lake in Crittenden and St. Francis Counties, Arkansas; Shell Lake located near Blackfish Lake; and Old Town Lake located southwest of Helena, Arkansas, in Phillips County.

Horseshoe Lake, covering 2,500 acres, is the largest natural lake in WRPA 2, and it is an outstanding example of the beauty of oxbow lakes and their surrounding wetlands

Ten Mile Pond is the only lake of any consequence remaining in the southeast Missouri lowlands. This oxbow lake is located in the Birds Point-New Madrid Floodway in Mississippi County. The surface area of Ten Mile Pond at normal water level is approximately 400 acres, surrounded by approximately 600 acres of bottomland forest. Ten Mile Pond supports a fair to good sport fishery with most of the species present which are normally found in warm water fisheries in this area. A preliminary investigation for a proposed Public Law 566 Watershed Project has been completed by the Soil Conservation Service for the area including Ten Mile Pond. In this preliminary investigation, Ten Mile Pond is proposed as a flood water storage area. This would be accomplished by the building of a levee surrounding the pond with a control structure which would maintain the normal water level in Ten Mile Pond except for periods of flooding when the water level would be raised about 7 feet and 1,400 acres temporarily inundated.

Bottomland Hardwoods

The remaining major stands of bottomland hardwoods, totaling almost 1.5 million acres, in WRPA 2 range in size from about 1,000 to 75,000 acres, but collectively occupy less than 3 out of every 10 acres of land in the planning area. Whether these hardwood forests are viewed as sources of commercial timber, havens for wildlife and waterfowl, unsightly breeding grounds for obnoxious vipers and mosquitos, areas of scenic splendor and scientific interest, or otherwise depends upon the perception of the viewer. In any case, the bottomland hardwoods represent part of a disappearing natural resource of national significance, and as such they merit express consideration in plans and programs for the future use of the area's water and related land resources.

Millstream shut-in on the St. Francis River near Fredericktown, Missouri, is one of several shut-ins on the upper St. Francis. It was formed by the caving in of the bluffs adjacent to the river completely blocking the river with huge boulders. The river, as it flows over, around, and between these boulders, forms a very unusual and aesthetically pleasing setting. The area is heavily wooded, with oak and hickory being the predominant species.

Dark Cypress Swamp is an example of one of the few remaining areas of bottomland hardwoods in the southeast Missouri lowlands. It is a wet, marshy area with the species of timber generally associated with that type of area, cypress being predominant. The timber has been harvested and cut over several times. However, the area has not as yet been lost and with preservation and proper management could be restored.

Unique Geological Systems

The most significant geological systems in WRPA 2 are Crowley's Ridge and the St. Francis Sunk Lands which occupy, respectively, about one-half million acres and 91,000 acres of the planning area. The Ridge is a remnant of natural geologic processes of ages past, whereas the Sunk Lands are a result of extraordinary processes associated with the New Madrid Earthquake of 1811-12. Both of these systems can contribute to man's knowledge and appreciation of his physical environment, and both merit protection for the benefit of future generations.

The St. Francis Sunk Lands, one of the most significant geological systems in the region, were created by the New Madrid earthquakes of 1811-12

Unique Ecological Systems

Crowley's Ridge and the St. Francis Sunk Lands, aside from their geological significance, possess unique ecological systems of intrinsic value and contribute to the general quality of life of the people living in and visiting WRPA 2. Other significant ecological systems are located in areas surrounding Stuttgart, Arkansas, and in the flood plain areas of the Lower White and Lower Arkansas Rivers. The areas at Stuttgart are centrally located prairie lands which have retained the original character of the Grand Prairie.

Wilderness Areas

Approximately 20,000 acres, or 4 percent, of the total area of Crowley's Ridge are in a near wilderness state of natural splendor and scientific interest. Smaller but similar type areas are located in the Lower Arkansas and Lower White River flood plains. These areas offer aesthetic enjoyment and limited forms of recreation such as camping, picnicking, and hiking.

MAJOR ENVIRONMENTAL PROBLEMS

Land

The primary land resources problem in the uplands area is the improper management of the forest resource. Considerable overgrazing of the forest resource is occurring and fire is still a significant problem. A possibility exists that future livestock operations will cause considerable acreages of forest land to be converted to pasture.

The natural environment of the southeast Missouri lowlands has been to a large extent replaced by a man-made environment. In excess of 90 percent of the lands of the area have been cleared and drained, and large scale land clearing continues. Lands are now being cleared to the extent that there are few windbreaks, resulting in a significant wind erosion problem and the almost complete loss in some areas of wildlife habitat. Preservation of the remaining areas of timber and the restoration of timber in other areas is needed.

Water

The water resources of the uplands are now in excellent condition. The primary problem associated with water resources is the proper management of the lands to insure that the streams are not degraded by runoff from the lands depositing silt or other objectionable material into the streams. Conservation practices to improve the hydrologic condition of the forest lands are the greatest need at present.

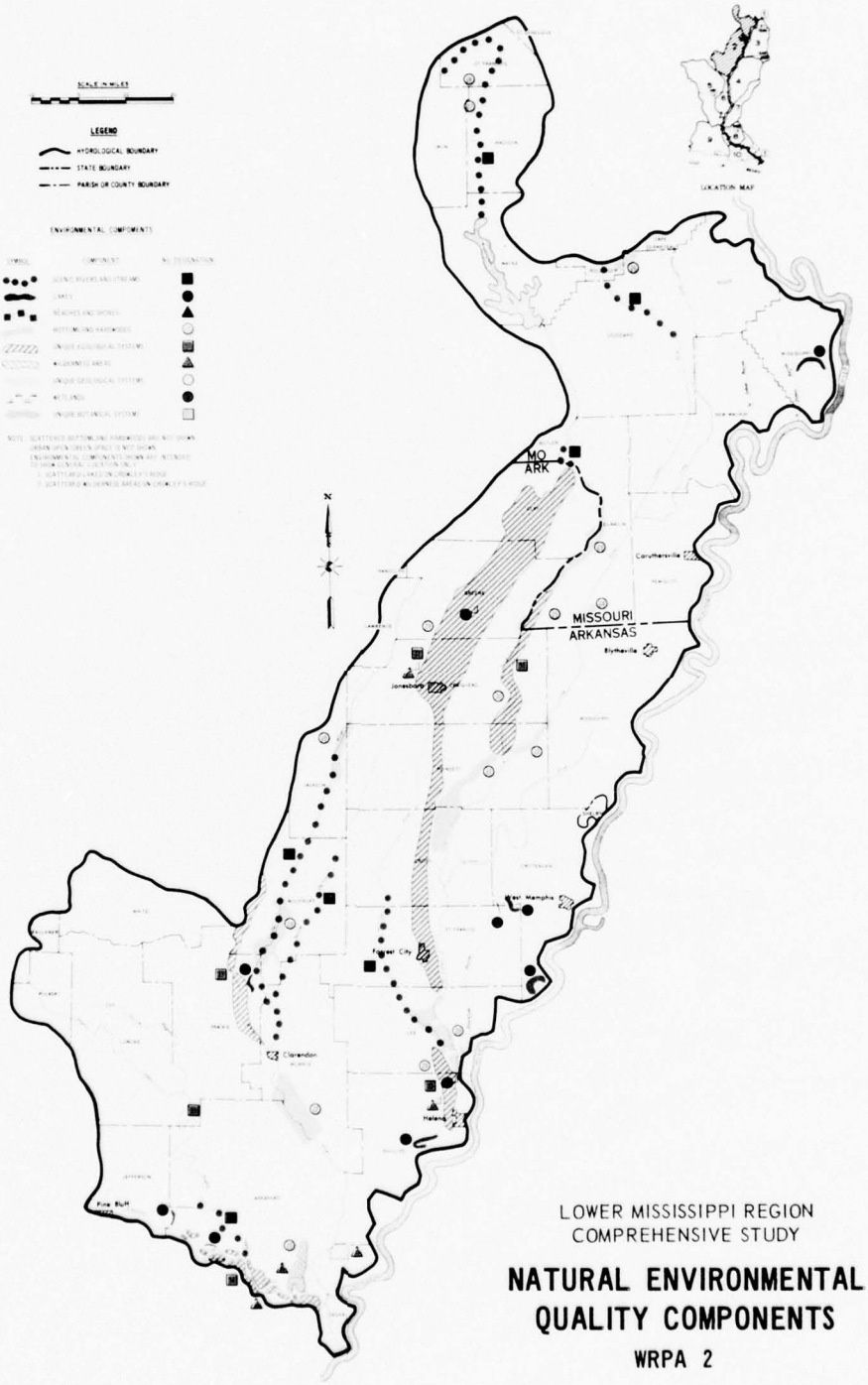
The most critical environmental problem in the lowlands is the threatened loss of remaining lakes, wetlands, and bottomland forests. The water levels are declining in most of these areas, partly as a result of being cut off from the main stem streams, and partly as a result of increasing runoff rates through drainage and channelization projects. Most of these remaining wet areas are now the target of local landowners who wish to completely drain them and place the lands thus reclaimed into cultivation.

Another significant environmental problem is the potential short term loss of fish and wildlife habitat associated with the waterways as they presently exist. Nearly all of these waterways are either drainage ditches or straightened river channels which have established a vegetative fringe along the banks and spoil areas which provide shade for the watercourses and habitat for wildlife. Many of these waterways also support a fair to good sport fishery. Many of these channels are now proposed for cleanout and enlargement. An example of this is St. John's Bayou, which is under study by the Corps of Engineers.

Land clearing (top) and land drainage (bottom) are two closely related endeavors which, while expanding the agricultural base, contribute significantly to losses of wetlands and bottomland hardwoods

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 2 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resource users, there is a short term (1980) need to protect 367 miles of scenic rivers and streams in addition to approximately 1.4 million acres of land and other water areas. The lands needed for environmental quality purposes include 900,000 acres of bottomland hardwoods, 402,000 acres of unique geologic systems (on Crowley's Ridge and in the St. Francis Sunk Lands), 67,000 acres of unique ecological systems, and 10,000 acres of wilderness area. They also include undeveloped shorelines of water bodies needed for environmental quality purposes. Such water bodies include eight existing lakes covering several thousand acres along the length of Crowley's Ridge. The locations of land and water areas needed for preservation of the natural environmental quality of WRPA 2 are shown on figure 4. The acreage needs are summarized in table 3.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 2

FIGURE 4

TABLE 3. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 2

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Scenic Rivers & Streams[1]	Miles	(367)	(0)	(367)	Need per mile equals 48 acres of land and 12 acres of water.
1	Castor River	Miles	40	0	40	From its intersection with Ditch No. 1, near Sikeston, Missouri, upstream to the Castor River Diversion Channel.
2	St. Francis River	Miles	100	0	100	The upper St. Francis River from Lake Wappapello to its origin near Bismark, Missouri.
3	Wilhelmina Cutoff	Miles	17	0	17	Cutoff of the St. Francis River, preserve old streambed and restore streamflow-located at Ark.-Mo. State line near Campbell, Mo.
4	L'Anguille River	Miles	50	0	50	Stream mile 5 to mile 55 near the St. Francis - Cross County Line, Arkansas.
5	Cache River	Miles	100	0	100	From stream mile 10, north of Clarendon, Ark., upstream to mile 110 near Newport, Arkansas.
6	Bayou DeView	Miles	40	0	40	From mouth east of Brinkley, Ark., upstream a distance of about 40 miles to near the Mo. Pacific Railroad crossing.
7	Bayou Meto	Miles	20	0	20	From mouth approximately mile 60 on Arkansas River, upstream to the Bayou Meto State Wildlife Refuge.
	Lakes[2]	Acres	(17,180)	(5,160)	(12,020)	
8	Ten Mile Pond	Acres	1,000	0	1,000	Located in the New Madrid Floodway in Mississippi County, Missouri (includes 200-foot strip along shore).
9	East Lake	Acres	925	800	125	Located SE of Clarendon Ark. Control 125 acres of undeveloped shore (200-strip along 5 miles of shoreline).
10	Horseshoe Lake	Acres	2,500	2,500	0	Located in Crittenden County, near Hughes, Ark. Need is for maintaining proper lake level with some form of water supply. Shoreline is acceptable control.
11	Swan Lake	Acres	550	500	50	Located near Bayou Meto State Wildlife Refuge, in Jefferson County, Arkansas. Control 50 acres of undeveloped shore.
12	Hannaberry Lake	Acres	375	350	25	Located near Langford, Ark., in Jefferson County. Control 25 acres of undeveloped shore, which is a 200-foot strip along 1 mile of shoreline.
13	Blackfish Lake	Acres	545	0	545	Preserve Lake., located in Crittenden and St. Francis Counties, Ark. Includes 400 acres lake and control of 300 acres of shoreline, which is a 200-foot strip along 6 miles of shore. Control structures must be placed in lake to prevent draining in times of low flow on Blackfish Bayou.
14	Shell Lake	Acres	135	110	25	Lake located near Blackfish Lake not likely to be in danger. Control 25 acres of undeveloped shoreline.
15	Old Town Lake	Acres	1,150	900	250	Located SW of Helena, Ark., in Phillips County. Control 250 acres of undeveloped shoreline.
16	Lakes on Crowley's Ridge	Acres	10,000	0	10,000	Create numerous small lakes. Distribute throughout the length of Crowley's Ridge.
	Bottomland Hardwoods	Acres	(1,128,000)	(130,000)	(998,000)	
17	St. Francis Batture Lands	Acres	40,000	0	40,000	Located on lands between levee and river from Crowley's Ridge to the mouth.
18	Cache River (Upper)	Acres	10,000	0	10,000	Located in upper flood plains of Cache River near Pitts, Ark.
19	Cache River (Lower)	Acres	75,000	0	75,000	Located in lower reach of Cache River and Bayou DeView, includes Black Swamp area.
20	L'Anguille River	Acres	22,000	0	22,000	Located in lower reaches of L'Anguille River flood plain, near Marianna, Ark.
21	Dismal Swamp	Acres	4,000	0	4,000	Located SE of Stuttgart, Ark., and north of and adjacent to the Arkansas Post Canal.
22	Lower White River	Acres	35,000	0	35,000	Located immediately upstream and adjacent to White River National Wildlife Refuge.
23	St. Francis River Upper Floodway	Acres	10,000	0	10,000	Located above St. Francis Lake in floodway near Marked Tree, Ark.
24	Hornersville Marsh	Acres	2,000	0	2,000	Near Hornersville, Missouri. Included in scattered bottomland hardwoods.
25	Buffalo Township River Bottoms	Acres	3,000	0	3,000	Near Cardwell, Missouri, in Dunklin County, Missouri. Also, included in "other" bottomland hardwoods.

TABLE 3. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 2 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Bottomland Hardwoods - continued					
(26)	*Dark Cypress Swamp*	Acres	*4,000*	*0*	*4,000*	*Near Bollinger - Stoddard County Line, Mo., in Castor River Bottoms. Also, included in "other" bottomland hardwoods.*
(27)	Arnet Shutin (St. Francis River)	Acres	1,000	0	1,000	Located near Fredricktown, Mo., in upper St. Francis, included in "other" bottomland hardwoods.
(28)	Mill Stream Shutin	Acres	1,000	0	1,000	Located near Fredricktown, Mo., in upper St. Francis, included in "other" bottomland hardwoods.
	All other hardwoods		921,000	130,000	791,000	
	Unique Geological Systems	Acres	(598,000)	(196,000)	(402,000)	
(29)	Crowley's Ridge	Acres	507,000[3]	155,000[1]	352,000	About 155,000 acres on Crowley's Ridge are in National forests, crops, State parks, and urban areas and are not likely to change status
(30)	St. Francis Sunken Lands[5]	Acres	91,000	41,000	50,000	About 41,000 acres are in State game management areas, etc., and are not likely to change status. Located in floodways, vicinity of Marked Tree, Ark.
	Unique Ecological Systems	Acres	(719,000)	250,000	469,000	
[31]	St. Francis Floodway	Acres	91,000	41,000	50,000	These are the St. Francis sunken lands which also qualify as unique ecosystems. About 41,000 acres are not likely to change.
[32]	Crowley's Ridge	Acres	507,000	155,000	352,000	This is a unique ecological system area in that it differs from most of the remainder of WRPA 2.
[33]	White River Batture Lands[5]	Acres	70,000	5,000	65,000	Located above White River National Wildlife Refuge and between Augusta and Clarendon, Ark. About 5,000 acres of the lower White River flood plain is not likely to change status.
[34]	Lower Arkansas Lands[5]	Acres	50,000	49,000	1,000	Only 1,000 acres in the lower Arkansas River flood plain are likely to change status.
[35]	Grand Prairie[6]	Acres	1,000	0	1,000	Centrally located prairie lands which have retained the original character of the Grand Prairie. Located in areas surrounding Stuttgart, Ark.
	Wilderness Areas	Acres	44,000	9,000	35,000	
<36>	Dismal Swamp[5]	Acres	4,000	0	4,000	All of Dismal Swamp is in a near "wilderness" state (also included in bottomland hardwoods category).
<37>	Crowley's Ridge	Acres	20,000	0	20,000	Areas of Crowley's Ridge in near wilderness state (also included in "Unique Ecosystems.")
<38>	Lower Arkansas River	Acres	10,000	9,000	1,000	Also included in "Unique Ecosystems."
<39>	Lower White River	Acres	10,000	0	10,000	Area principally within White River National Wildlife Refuge. Although in public ownership, not preserved as "Wilderness" area.
	Open and Green Space	Acres	8,000	7,100	900	Additional lands needed near urban areas (unidentified location).
	Total Land, All Components	Acres	(1,644,000)	(292,100)	(1,351,900)	
	Forests					
	Bottomland Hardwoods		*1,128,000*	*130,000*	*998,000*	
	Other Forests		350,000	155,000	195,000	Crowley's Ridge geological systems
	Pasture		158,000	0	158,000	Crowley's Ridge
	Urban		8,000	7,100	900	
	Other		0	0	0	
	Total Water, All Components	Acres	(16,360)	(5,160)	(11,200)	
	Large Water		6,360	5,160	1,200	
	Small Water		10,000	0	10,000	Create small lakes on Crowley's Ridge

1/ 48 acres of land per mile (200-ft. strip along each bank) included in bottomland hardwoods category.
2/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.
3/ Includes 350,000 acres classified as mixed forests and 157,000 acres classified as pasture.
4/ Forests.
5/ Included in bottomland hardwoods category.
6/ Classified as pastureland.

W R P A 3

ENVIRONMENTAL SETTING

General

WRPA 3 is located in southwestern Kentucky, western Tennessee, and northwestern Mississippi, and includes the Cairo, Illinois, area as shown in figure 5. It lies within the Alluvial Valley and Eastern Hills Physiographic Provinces of the Central Gulf Coastal Plain. The 6.8 million acres of this planning area, 99 percent of which is land area, represent 10 percent of the entire Lower Mississippi Region.

WRPA 3 is bounded on the west by the Mississippi River, on the north and east by a line which separates the drainage areas of the Ohio and Tennessee Rivers from the Mississippi River, and on the south by a line which separates the drainage areas of Nonconnah Creek, Wolf River, and Hatchie River from the Coldwater and Little Tallahatchie Rivers.

Land Forms

The topography of the area is fairly uniform, ranging from flat lands along the stream bottoms to rolling hills. Some of the uplands, particularly in that half of the area next to the Mississippi River, are fairly flat and well suited for cultivated crops and pastures. The hills become more rolling as you move from the Mississippi River toward the eastern edge of the area.

In Tennessee, the uplands consist of gently rolling hills and ridges that are deeply dissected and gullied in many places. They slope gently westward from elevations of about 700 feet down to about 400 feet. Watersheds exhibit dendritic drainage patterns; and primary flood plains of the major rivers, including the Obion, Forked Deer, Hatchie, Loosahatchie, Wolf, and Nonconnah, are generally very narrow, averaging about 1 mile in width near the center of the basins. Undrained flood plains consist of an almost continuous expanse of woodland, brush, and swamp, interwoven with abandoned river channels. Bottomlands, particularly those of the Obion and Forked Deer Rivers, are bisected with small drainage canals which were constructed in the early 1900's.

Land Use

Approximately 2.3 million acres (34 percent) of WRPA 3 are forested; this represents 8 percent of the forest land in the Lower Mississippi Region.

Water Bodies

Rivers and Streams

The principal streams in the WRPA 3 area are the Obion, Forked Deer, Hatchie, Loosahatchie, and Wolf Rivers.

The Obion River rises along the Mississippi River-Tennessee River Divide and flows westerly through flood plains, varying in width from 1 to 3 miles to enter the alluvial valley. The principal tributary is the Forked Deer River.

The predominantly hilly area surrounding the Hatchie River and its tributaries results in small flood plains and alluvial valley areas.

The Loosahatchie and Wolf Rivers, along with their tributaries, flow in a westerly direction through narrow flood plains.

The majority of the streamflow which originates within WRPA 3 is produced by the Obion and Hatchie River Basins. At the present time, there is no regulation by dams on streams in this area. There is presently a dam under construction by the Soil Conservation Service on the Middle Fork of the Obion River.

Natural Lakes

Reelfoot Lake, located west of Union City, Tennessee, is the largest natural lake in WRPA 3. It covers 33,100 acres and provides good fishing and waterfowl habitat. It is, however, filling in and expected to last only about 40 more years. Other natural lakes include Open Lake, which covers about 500 acres near Ripley, Tennessee, and Chisholm Lake and Horn Lake, both of which are scenic oxbow lakes of the Mississippi River. Chisholm Lake covers 200 acres, while Horn Lake covers only 30 acres. Both oxbows, however, are important to the WRPA not only from the standpoint of providing fish and wildlife habitat, but also from the standpoint of providing landscape diversity.

Man-made Impoundments

Several lakes serving the primary purposes of recreation and fish and wildlife, while adding to the environmental quality of the WRPA, have been constructed throughout the planning area by the States of Tennessee and Kentucky. These include Carroll Lake, 100 acres; Garrett Lake, 180 acres; Herb Parsons Lake, 180 acres; Humboldt Lake, 90 acres; Maples Creek Lake, 90 acres; Shelby Lake, 80 acres; Turner Lake, 100 acres; and Whiteville Lake located within the 18,000 acres of the Upper Anderson-Tully Wildlife Management Area in Tennessee. Additional information on these lakes can be found in Appendix D, Inventory of Facilities; and information on fish and wildlife needs can be found in Appendix Q, Fish and Wildlife.

There are a number of small reservoir projects being planned by the U.S. Soil Conservation Service under upstream watershed programs in

Reelfoot Lake, created by the New Madrid earthquakes of 1811-12, is the single most outstanding feature of the WRPA 3 environment

WRPA 3. These projects are primarily for flood prevention, but some are multiple-purpose, including provisions for recreation. In addition to the planned Soil Conservation flood prevention reservoirs, numerous farm ponds for livestock watering or recreation (fishing) have been constructed in the WRPA and add to the diversity of the landscape. The most outstanding impoundment of this type, located near Obion Creek in Kentucky, is Murphy's Pond, a publicly owned 100-acre lake surrounded by about 2,000 acres of swamp.

HISTORICAL BACKGROUND

Land Resources

Around the turn of the 19th Century practically all of the area designated in this study as WRPA 3 was the domain of a small but fierce tribe of Chickasaw Indians. The Chickasaw claims were honored both by British colonists prior to the American Revolution and the United States after the war. However, the Indian claim began to deter the westward movement of American settlers during the late 1700's; and in 1818 Isaac Shelley, a Kentuckian, and Andrew Jackson, a Tennessean, secured west Tennessee and a small portion of Kentucky for the United States through negotiations with the Indians.

Once west Tennessee was opened for American occupation, settlement was rapid. Pioneers came from nearby middle Tennessee and from all the older sections of the United States, bringing their possessions on keel boats out of the Tennessee, Cumberland, and Ohio Rivers down the Mississippi. The necessity of filing title claims and of buying land at the territorial land office in Jackson, on the South Fork of the Forked Deer River, helped make that town the hub of West Tennessee settlement.

Travel was a major problem to the pioneers and to their descendants until well into the 19th Century. In the early years, there were very few connecting railroads between trade centers, and wagon roads through dense forests were often times impassable during rainy weather. Early travel was therefore largely by water, but even that was difficult. In 1828 a regular shipping route was established between Bolivar and Randolph at the mouth of the Hatchie River to transport settlers, furs, and farm supplies.

Commercial agriculture in southwest Tennessee began to develop in the 1830's. By the end of that decade, the area was growing well over half of Tennessee's cotton; subsequent cotton production of the area doubled every 5 years until 1860. During that time the land suffered from abusive agricultural practices, and cycles of debt, overextension, depression, more debt, etc., significantly hampered agricultural programs. From the 1860's until about the end of the Great Depression of the 1930's, cotton production continued to climb, but personal income and property values were depressed to about half of the 1860 level until after the turn of the century.

As early as the 1850's, progressive farmers had begun to recognize the wastefulness of reckless timber cutting and the highly erosive nature of the region's soils. Fayette County farmers organized one of the best agricultural societies in Tennessee, and efforts were made to preserve and restore the soil and to conserve the timber. Unfortunately, few heeded the warnings or good examples of the early agricultural societies;

most farmers had enough uncleared land to be unconcerned about gullies in exhausted fields, and generally chose to abandon such areas for new ground. Conservation measures promised no immediate cash return and only undetermined long-term benefits. Without money to buy even the chemical fertilizers which became available after 1875, farmers could hardly afford restorative land treatment and crop rotations. Today, massive gullies, overcropped land, and poverty dwellings are prevalent throughout much of the WRPA.

Water Resources

Past water resources projects affecting the quality of the environment in WRPA 3 have consisted mostly of channel works. Channel improvement work was done on the upper reaches of the Obion River and its tributaries from about 1914 to the early 1920's. That work consisted of new channels on the North Fork, Middle Fork, South Fork, and Rutherford Fork. The channel improvement extended downstream on the Obion River to a point 3 miles west of the town of Obion, Tennessee, or about 58 river miles upstream from the mouth of the Obion River. The work unfortunately did not extend far enough downstream to reach an adequate outlet. At the time of construction, most of the land below the improvement was in woods and was not considered subject to flood damage.

Channel improvement work was done on the upper reaches of the Forked Deer River and its tributaries from about 1916 to the early 1920's. That work consisted of new channels: one on the North Fork and Middle Fork downstream to the vicinity of Dyersburg, Tennessee, where the two channels converge; and one on the South Fork down to the vicinity of Fowlkes, Tennessee. As in the Obion Basin, most of the flood plain below these points was in woods at the time of the improvement and was not considered subject to flood damage.

Channel improvements on the Forked Deer River and its major tributaries - the North Fork, the Middle Fork, and the South Fork - were authorized in the Flood Control Act of 1948. Those improvements have been partially completed.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in this appendix, the most significant environmental quality component in WRPA 3 is Reelfoot Lake. This water body, in addition to its unique geological origin, offers a variety of other environmental quality features including its scenic setting and unique ecological system. Aside from Reelfoot Lake, there are other lakes, rivers amd streams, and stands of bottomland hardwoods scattered throughout the area. There are also other unique geological and ecological systems, a unique botanical system, and significant wetlands. There are no significant beaches or shores in WRPA 3 because of its inland location.

Scenic Rivers and Streams

Both the Hatchie and Wolf Rivers and the Obion-Forked Deer River System have long reaches of essentially undeveloped and scenically attractive shorelines of such value as to merit maintenance in their current state. In addition to these long free-flowing reaches, there are similar, but shorter, reaches along Mayfield Creek, Obion Creek and Bayou Du Chien in Kentucky, and along Nonconnah Creek and Loosahatchie River in Tennessee.

In 1970 the Hatchie River was named by the Tennessee Legislature as one of 11 scenic rivers in Tennessee, meriting its inclusion in the national system of scenic rivers. The Hatchie River is an old river, geologically speaking, as evidenced by its broad flood plain and by its many meanders and oxbow lakes. Along the river, hardwood forests provide wildlife habitat, offer wilderness-type recreation, and contribute to the regional economy. These attributes and the free-flowing water of the river are typical of the other scenic rivers and streams in the WRPA.

A recent plan jointly prepared by the Memphis District, U.S. Army Corps of Engineers, and the River Basin Staff, Department of Agriculture, proposes public control of a narrow strip of land along both banks of the river through acquisition of permanent easements. This would be done in three stages, based on needs for preserving areas of high scenic quality and development potential and good existing access. Lands required for recreational development should be purchased in fee simple. Three tributary basins have potential for recreational reservoirs ranging from 1,400 to 3,300 acres in size.

Recognition has been given to the possible need for main-stem channel improvement as far downstream as Serles. Channel alteration

beyond this point, however, would be highly damaging to scenic river development. Implementation of the plan would aid in preserving the scenic quality of the Hatchie River in Tennessee and developing existing resources along the river and several tributaries for a variety of public recreational uses.

Lakes

Within the hydrologic boundary of WRPA 3, there are at least three natural lakes whose scenic setting and sparsely developed shorelines are of such special value that they merit being maintained in their existing state as an inheritance for future generations. The largest of these is Reelfoot Lake, which covers approximately 33,100 acres in Lake County, Tennessee. Others include Chisholm Lake, which covers 200 acres, and Horn Lake, which covers 30 acres.

Reelfoot Lake is highly unusual from many standpoints. It is a natural lake formed by the New Madrid earthquake of 1811 and 1812, the most violent earthquake on record in the United States. Reelfoot was caused by a rising and sinking movement of the land which carried down an entire forest. Reelfoot today is a large body of fresh water about 5 miles wide and 20 miles long. Its depth varies from a few inches to 40 feet, with an average of about 10 feet. It is regarded as one of the finest lakes in the south for freshwater fishing.

Bottomland Hardwoods

The remaining major stands of bottomland hardwoods in WRPA 3 range in size from about 3,000 to 24,000 acres, but collectively occupy less than 1 out of every 8 acres of land in this planning area. The oak-gum-cypress and elm-ash-cottonwood forests in the delta area of WRPA 3 are in a relatively poor condition because most forest management has been directed to the pine, pine-hardwood, and oak-hickory forests. However, many of the hardwood stands are currently under State ownership and are operated as Wildlife Management Areas.

Examples of such areas are the Gooch, Tigrett, and Moss Island Wildlife Management Areas which together total 13,200 acres. The Anderson-Tully Wildlife Management Area covers 20,000 acres; Reelfoot Wildlife Management Area, 23,500 acres. The Hatchie Wildlife Management Area contains 11,000 acres of hardwood and swamp. Two wildlife management areas, the Chickasaw and the Shelby, serve a dual function--protection of hardwood and wetland areas and protection of habitat for wildlife. The current status of those areas is not likely to change during the next 50 years.

The remaining bottomland hardwoods in WRPA 3, such as these around Reelfoot Lake, collectively occupy only one acre out of every eight

Unique Geological Systems

The most significant geological systems in WRPA 3 are Reelfoot Lake and Owl Creek Fossil Bed. Reelfoot Lake, formed by the New Madrid earthquake of 1811-1812 covers 33,100 acres, and most of the area is under public ownership and protection at the present time. The Owl Creek Fossil Bed covers 100 acres and is found in the vicinity of the Mississippi-Tennessee River divide in the headwaters of the Hatchie River tributaries area. It is not presently under public protection or ownership.

Unique Ecological Systems

Reelfoot Lake and Murphy's Pond possess unique ecological systems of intrinsic value. Reelfoot Lake, although most of its 33,100 acres are under adequate public control, has a major problem with sediment accumulation. Murphy's Pond, covering 100 acres, is located near Obion Creek in west Kentucky.

On Middle Fork, Obion River, in Weakley County, Tennessee, is a large cypress tree within a 12-acre tract of timber set aside for public enjoyment. This tree is recorded in the American Forestry Association's

Murphy's Pond is one of the most significant environmental features in WRPA 3

Social Register of Big Trees as the "World's biggest Cypress Tree" and the area is under State ownership as part of the Natural Areas Act.

Wetlands

The swamps or wetlands in WRPA 3 support a wide variety of flora and fauna and are a valuable asset to wildlife protection. The river bottom forests and swamp ecosystems, such as typified by the Hatchie Swamp Area and the Obion and Forked Deer basin areas, are generally recognized as some of the richest and most productive in the world. Such wetlands compare favorably with the well-documented productivity and importance of estuaries; however, intensive research of the bottomland systems has been rather recent and limited. The wetness, periodic seasonal drying, abundance of organic matter, nutrient influx from the uplands, etc., provide the basic essentials or building blocks for this highly productive environment.

In the Hatchie and Obion and Forked Deer basin areas, nature's modifying influences have had a helping hand from man. Modification of siltation patterns and permanent flooding have resulted in large areas of dead timber. Such areas have become very important swamp components of the environment; and insofar as wildlife and fisheries resources are concerned, the sites are positive additions to the total habitat complex.

The primary habitat components of the bottoms are as follows: mixed hardwoods (oak, maple, gum, ash, elm, hickory), swamp forests (cypress and tupelo), "open" swamps (willow and other aquatic and semi-aquatic plants), and open water (oxbows and streams). The swamp habitat is enhanced by the interspersion of these components and by the fertility, abundance of food, adequacy of cover, and relative isolation of the areas.

The wetlands of the Hatchie and Obion and Forked Deer basin areas have traditionally provided an important and usually dependable component of the total migration and wintering requirements of waterfowl of the Mississippi Flyway. The importance has varied from year to year depending on the status of the habitat and the magnitude of the fall flight. The value of such habitat as living space for ducks is increasing daily due to habitat losses directly tied to drainage and clearing. The same applies to the importance of such wetlands in providing hunting recreation.

At the confluence of Mud Creek is a typical tract of wetlands along the Obion River

MAJOR ENVIRONMENTAL PROBLEMS

One of the greatest natural resource problems in WRPA 3 is that of erosion and sediment damage, particularly in the Hatchie River drainage area in Tennessee. The soil displaced by erosion in that area amounts to almost 7 million tons each year, and about two-thirds of the basin area annually suffers some erosion damage. Another major problem area is at Reelfoot Lake where the steady flow of sediment is slowly filling in and destroying the area's valuable fish and wildlife habitat.

Reelfoot Lake is fed primarily by the 82,660-acre Reelfoot-Indian Creek watershed in Tennessee and Kentucky. High rates of erosion of the upland soils of that watershed have caused extensive sedimentation within the flood-plain areas and in Reelfoot Lake. Thick alluvium in the flood plains is a result of the gradual deposition of layer upon layer of flood deposited sediment. The sediment is from loess soils that have a relatively high inherent fertility, and the deposits do not have an adverse effect on the productivity of the flood-plain soils.

An estimated 106 acre-feet of sediment are deposited annually by Reelfoot Creek on its delta and in Reelfoot Lake. In addition, an estimated 14 acre-feet of sediment are deposited annually by Indian Creek and minor tributaries. A report, "Dredging Report, Reelfoot Lake State Park," by the Tennessee Department of Conservation describes the

Natural and man-caused soil erosion and resulting sedimentation are critical problems in the Hatchie Basin of WRPA 3

distribution of this sediment in various sections of the lake area. The sedimentation has the long term effect of reducing the open water area of the lake and also reduces the volume of the lake basin. In addition, frequent inflows of muddy water have an adverse effect upon the fish and wildlife within the lake area. The deposition of sediment in Reelfoot Lake also necessitates an expensive channel maintenance and vegetative control program.

Extensive studies have been made by the U.S. Fish and Wildlife Service and Tennessee Game and Fish Commission to determine sediment damage to Reelfoot Lake. Those studies have shown that maintenance costs and damages to fish and wildlife values from sediment produced in the Indian Creek watershed amount to thousands of dollars annually. No comparable studies have been made of damages from sediment produced in the Reelfoot Creek watershed. However, it is reasonable to assume that sediment produced in that watershed causes damages similar to those associated with the Indian Creek watershed.

The erosion and sediment problems in WRPA 3 are closely related to other problems induced by high frequency flooding. Spring floods in the area not only cause direct water damage to property; they also delay land preparation and planting or necessitate replanting. This causes reduced crops and often leaves the soil open to erosion for long periods of time.

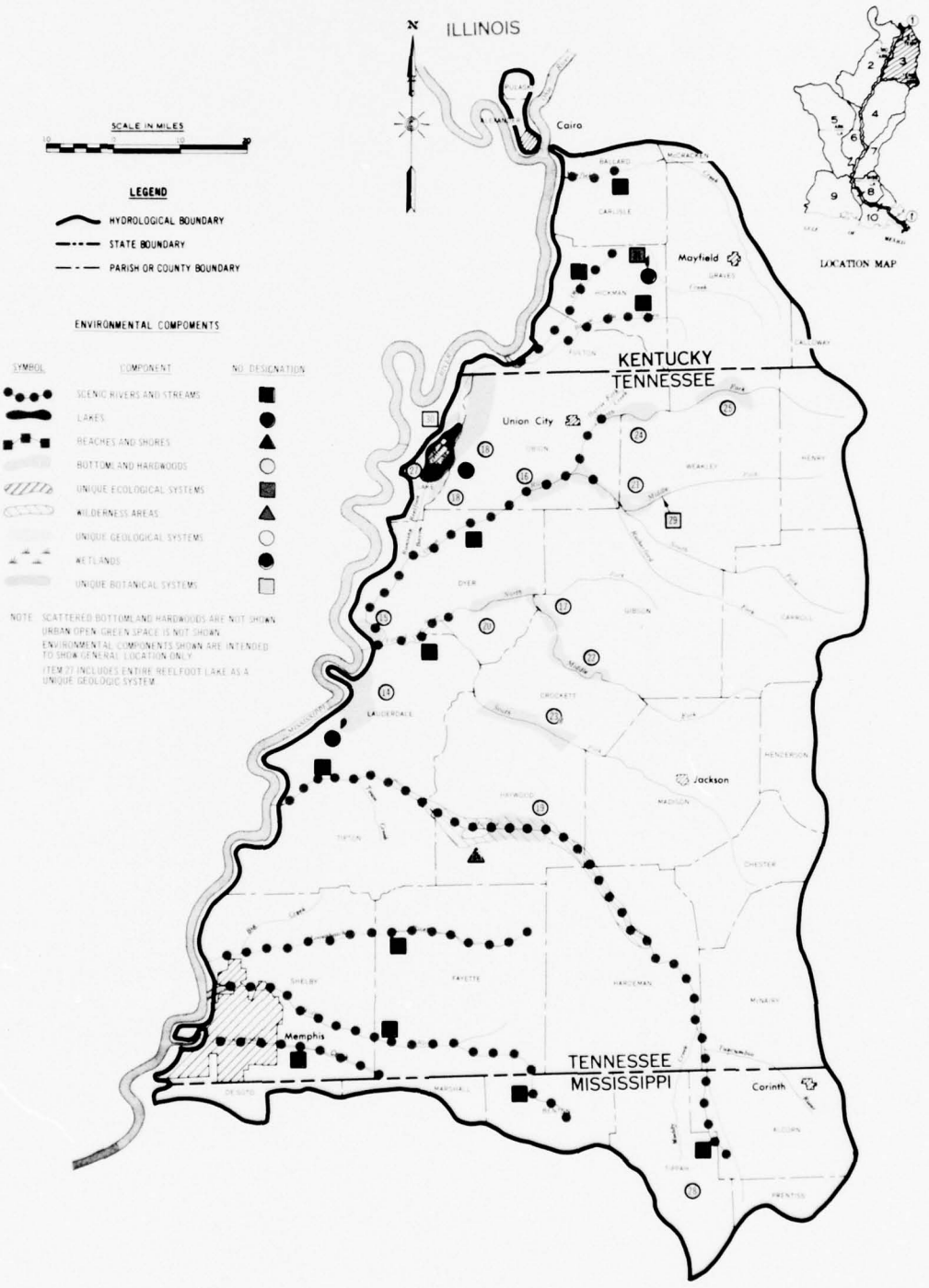
Measures to substantially reduce the problems in the Reelfoot-Indian Creek watershed area and other watersheds of WRPA 3 are planned by the Soil Conservation Service. Included are land treatment measures to improve hydrologic cover conditions and to effect a decrease in run-off, erosion, and production of sediment; flood water retarding structures for the control of damaging waterflow and sediment; and channel improvements to reduce the frequency of damaging overflow of flood water and sediment.

Aside from work planned by the U.S. Soil Conservation Service, the Tennessee Conservation Department has studied the feasibility of dredging Reelfoot Lake to restore some of the depth. Based on conclusions of the study, the removal of approximately 11,000,000 cubic yards of silt from the lake area over a period of 15 years without serious damage to either the lake or inhabitants appears to be feasible.

The channelization of Porter Creek, shown here, and other streams in WRPA 3 has caused serious declines in the overall environmental quality of these water bodies

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 3 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resources users, there is a short-term (1980) need to protect 514 miles of scenic rivers and streams along with more than 700,000 acres of land and other water areas. The lands needed for environmental quality purposes include approximately 650,000 acres of bottomland hardwoods, 500 acres of unique geologic systems, 500 acres of unique ecological systems, and 53,000 acres of wilderness area (marshes and swamps). They also include undeveloped shorelines of water bodies needed for environmental quality purposes. Such water bodies include three natural lakes covering about 33,000 acres. The locations of land and water areas needed for preservation of the natural environmental quality of WRPA 3 are shown on figure 5. The acreage needs are summarized in table 4.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 3

FIGURE 5

TABLE 4. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 5

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Scenic Rivers and Streams[1]	Miles	(571)	(57)	(514)	Need per mile equals 48 acres of land and 12 acres of water.
(1)	Hatchie River, Miss.	Miles	19	0	19	From McNairy County on Miss.-Tenn. state line southeast, upstream to junction with Elliott Creek near town of Collinston, Alcorn County, Miss.
(2)	Hatchie River, Tenn.	Miles	170	20	150	River presently designated as scenic stream in Tenn. Net need shown is for preservation of stream banks and woodland strip, to insure natural vista. From mouth of Hatchie River (Mississippi River mile 775 AHP) to Tenn.-Miss. state line. Existing supply in estimate of bank area in wildlife areas, etc., not likely to change status.
(3)	Wolf River, Miss.	Miles	11	0	11	From Tenn.-Miss. state line in Benton Co., Miss., to junction with Tubby and Grogg Creeks.
(4)	Wolfe River, Tenn.	Miles	114	4	110	From mouth of Wold River (Miss. River mile 738 AHP) through city of Memphis and Shelby County on to Tenn-Miss. state line in Fayette County, Tenn. Existing supply is that already in some form of public ownership, not likely to change status.
(5)	Mayfield Creek	Miles	10	0	10	From mouth of creek (Miss. River mile 916 AHP) upstream to highway 440 near Hurricane Creek, in Ballard and Carlisle Counties, Ky.
(6)	Obion and Forked Deer River System	Miles	127	27	100	Main stem of Obion River (80 miles), north fork of Obion River (22 miles), south fork of Obion River (5 miles), main stem of Forked Deer River (15 miles), north fork of Forked Deer River (5 miles): all from mouths upstream. Existing supply is that estimated to be in some form of public ownership, not likely to change status.
(7)	Bayou Du Chien	Miles	10	0	10	From mouth of creek upstream, near Hickman, Ky.
(8)	Obion Creek	Miles	20	0	20	From Hickman Harbor upstream to U. S. Highway 51.
(9)	Nonconnah Creek	Miles	30	4	26	From McKellar Lake upstream to Tenn.-Miss. state line. Existing supply is that owned by local government and will be kept in wooded state.
(10)	Loosahatchie River	Miles	60	2	58	From mouth at Mississippi River, in Shelby County, Tenn., upstream to east of U. S. Highway 64 in Fayette Co., Tenn., at junction with Craig Creek.
	Lakes[2]	Acres	(34,100)	(33,200)	(900)	
(11)	Reelfoot Lake	Acres	33,500	33,100	400	About 400 acres of undeveloped lands bordering lake shore. Remainder of area is in public control and not likely to change status. Located in Lake and Obion Counties, Tenn.
(12)	Murphy's Pond	Acres	100	100	0	Located near Obion Creek (stream mile 21) in Hickman County, Ky.
(13)	Open Lake	Acres	500	0	500	Located about 10 miles SW of Ripley, Tenn., near the Miss. River.
	Bottomland Hardwoods	Acres	(796,000)	(131,400)	(664,600)	
(14)	Anderson-Tully Wildlife Management Area	Acres	20,000	20,000	0	Block of bottomland hardwoods, including swampy areas, located from mouth of Obion River near Hales Point, Miss. River mile 821 AHP, and bordered by Miss. River on west to near mile 803 AHP near Open Lake, in Tenn. Whole area not likely to change status.
(15)	Moss Island Wildlife Area	Acres	3,200	3,200	0	Located on the west bank of the Obion River in vicinity of river mile 5. Not likely to change status.
(16)	Gooch Wildlife Area	Acres	6,100	6,100	0	Located on the south bank of the Obion River in vicinity of river mile 70. Not likely to change status.
(17)	Tigrett Wildlife Area	Acres	3,900	3,900	0	Located vicinity of stream mile 15 on the north fork of Forked Deer River about 15 miles SE of Dyersburg, Tenn. Not likely to change status.
(18)	Reelfoot Management Area	Acres	23,500	23,500	0	Located north and west areas of Reelfoot Lake in Lake and Obion Counties, Tenn. Not likely to change status.

TABLE 4. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 3 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Bottomland Hardwoods (continued)					
(19)	Hatchie National Wildlife Refuge	Acres	11,000	11,000	0	Located in Hatchie River bottoms in central Haywood County, Tenn. Not likely to change status.
(20)	Eaton-Tatum Area	Acres	3,000	0	3,000	Located in vicinity of mile 2 on the middle fork of Forked Deer River.
(21)	Simmons Bottom and Manus Area	Acres	10,000	200	9,800	Located in vicinity of mile 5 on the south fork of Obion River, near Obion Weakley County line.
(22)	Middle Fork Forked Deer Bottom	Acres	7,500	0	7,500	Located in vicinity of mile 10 on the middle fork of Forked Deer River, SE of Dyersburg, Tenn.
(23)	South Fork Forked Deer Bottom	Acres	12,000	0	12,000	Located in vicinity of stream mile 20 on south fork of Forked Deer River, south of Dyersburg, Tenn.
(24)	North Fork Obion Bottom, I	Acres	5,300	0	5,300	Located vicinity of stream mile 10 on north fork of Obion River, east of Union City, Tenn.
(25)	North Fork Obion Bottom, II	Acres	7,000	0	7,000	Located vicinity of stream mile 30 on north fork of Obion River, about 25 miles east of Union City, Tenn.
	Scattered Areas	Acres	683,500	63,500	620,000	Scattered throughout west Tenn., west Ky., and north Miss. in river and creek bottoms about 63,500 acres not likely to change status.
	Wetlands	Acres	(64,000)	(11,000)	(53,000)	
(26)	Hatchie Swamp Area 3/		64,000	11,000	53,000	Located in Hatchie River bottomlands, approximately from stream mile 40 to the head of navigation, stream mile 135.
	Unique Geological Systems	Acres	(33,600)	(33,100)	(500)	
(27)	Reelfoot Lake 4/	Acres	33,500	33,100	400	Most of area under adequate public control. The lake was formed by the New Madrid earthquakes.
(28)	Owl Creek Fossil Bed	Acres	100	0	100	Vicinity of Miss. River-Tenn. River divide in headwaters of Hatchie River tributaries area.
	Unique Botanical Systems	Acres	(12)	(12)	(0)	
[29]	Big Cypress Tree 3/	Acres	12	12	0	Located in NW Tennessee, the area is in public ownership.
	Unique Ecological Systems	Acres	(33,600)	(33,200)	(400)	
[30]	Reelfoot Lake	Acres	33,500	33,100	400	Most of area under adequate public control. However, sediment accumulation a major problem.
[31]	Murphy's Pond	Acres	100	100	0	Located near Obion Creek in West Kentucky.
	Open and Green Space	Acres	34,000	2,900	31,100	Urban oriented open and green space. Existing supply consists of Class I recreation lands.
	Total Land, All Components	Acres	(830,100)	(134,300)	(695,800)	
	Forests					
	Bottomland hardwoods		796,000	131,400	664,600	
	Other Forests		0	0	0	
	Pasture		0	0	0	
	Urban		34,000	2,900	31,100	
	Other		100	0	100	
	Total Water, All Components	Acres	(40,300)	(36,400)	(3,900)	
	Large Water		33,700	33,200	500	
	Small Water 5/		6,600	3,200	3,400	

1/ 48 acres of land per mile (200-ft. strip along each bank) included in bottomland hardwoods.
2/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods.
3/ Included in bottomland hardwoods category.
4/ Included in lakes category.
5/ Surface area of scenic streams.

W R P A 4

ENVIRONMENTAL SETTING

General

WRPA 4 is located in northwestern Mississippi, as shown in figure 6. This planning area can be divided into two distinct physiographic areas: the Yazoo uplands and the Yazoo alluvium. The 8.5 million acres of WRPA 4, 98 percent of which is land area, represent 13 percent of the entire Lower Mississippi Region.

WRPA 4 is bounded on the north by the northern boundary of the Coldwater and Tippah River watersheds, on the south by the northern boundary of the Big Black River watershed, on the east by the western boundary of the Tombigbee River watershed, and on the west by the east bank Mississippi River levees.

Land Forms

The Yazoo uplands physiographic area comprises 4.2 million acres. The topography of the uplands or hills is gentle to steeply rolling, with scattered flatland and valleys. Stream gradients average 1.5 feet per mile, while elevations of land forms throughout the area range from 300 to 500 feet above mean sea level and reach 640 feet m.s.l. near New Albany.

The Yazoo alluvium physiographic area, commonly referred to as the Mississippi Delta, contains 4.3 million acres. The topography is flat, with land slopes of approximately one-half foot per mile toward the Gulf of Mexico. Elevations range from 90 feet m.s.l. near Vicksburg to 200 feet m.s.l. near Tunica. Stream gradients vary from one-fourth to one-half foot per mile.

Land Use

Approximately 3.2 million acres (35 percent) of WRPA 4 are forested; this represents 11 percent of the forest land in the Lower Mississippi Region.

Agricultural land in cropland and pasture accounts for 59 percent of the land in the planning area. Approximately 3.3 million acres are classified as cropland and 1.3 million acres are classified as pastureland.

Urban and built-up areas account for 4 percent of WRPA 4, and the remaining 2 percent is in other miscellaneous uses.

Water Bodies

Rivers and Streams

The principal stream system of WRPA 4 is the Yazoo-Tallahatchie-Coldwater, which consists of the lower 46 miles of the Coldwater River, all 84 miles of the Tallahatchie River, and all 169 miles of the Yazoo River. The lower 169 miles of the system are deeply entrenched throughout, having banks from 30 to 45 feet high and channel widths of 300 to 500 feet. Much of the streamflow which is generated within the WRPA originates in the tributary basins in the hill area. The principal hill tributaries - Coldwater, Little Tallahatchie, Yocona, and Yalobusha Rivers - rise in north-central Mississippi and flow westerly or southwesterly to form or join the main stem of the Yazoo River system. The flows discharged from the principal hill tributaries are completely controlled by the operation of Grenada, Enid, Sardis, and Arkabutla Reservoirs. These reservoirs control about 60 percent of the total drainage area of the Yazoo system above Greenwood, Mississippi. The principal alluvial valley streams are the Big Sunflower River and Steele Bayou. These streams and their tributaries are characterized by relatively flat gradients and low velocities.

The Yazoo River and its tributaries dominate the environmental base of the Mississippi "delta" in WRPA 4

The Coldwater River rises in the hills of Marshall County, Mississippi, and is joined by Hickahala and Pigeon Roost Creeks and smaller streams before flowing into Arkabutla Lake. Leaving the lake, Coldwater River enters the delta section where it is joined by the flows from the Lake Cormorant area, Arkabutla Canal, and other smaller streams. In the vicinity of Crenshaw, Mississippi, the flow of the Coldwater River is diverted through Pompey Ditch north of Marks, Mississippi. Here the stream is joined by David and Burrell Bayous. In the vicinity of Lambert, Mississippi, the Coldwater River is met by the channel of Old Little Tallahatchie River, which now carries only the flows of Bobo Bayou and smaller streams. At this point, Coldwater River becomes Tallahatchie River.

Principal hill tributaries of the Tallahatchie River are the Little Tallahatchie and Yocona Rivers, which originate in Union and Pontotoc Counties, Mississippi, respectively. The Little Tallahatchie River is joined by Tippah River and smaller tributaries before discharging into Sardis Lake. Below the lake the Little Tallahatchie River is routed through the Panola-Quitman Floodway, which also collects flows from Yocona River before entering the Tallahatchie River west of Charleston, Mississippi. The Yocona River, joined by Otoucalofa Creek and smaller tributaries, enters Enid Lake in northern Yalobusha County, Mississippi. Downstream of the lake, Yocona River enters the Panolaquitman Floodway near Crowder, Mississippi.

Principal Delta tributaries of Tallahatchie River are Cassidy, Opossum, and Hurricane Bayous. Tillatoba Creek, a hill tributary, enters Tallahatchie River at the junction with the Panola-Quitman Floodway. The Tallahatchie River main stem begins at the confluence of the Coldwater River with the channels of Old Little Tallahatchie and Old Yocona Rivers and terminates at Greenwood, Mississippi, where it and Yalobusha unite to form the Yazoo River.

The Yalobusha River rises in Chickasaw County, Mississippi, and flows in a westerly direction.. Near Grenada, Mississippi, the Yalobusha and Skuna Rivers merge with smaller streams to form Grenada Lake. Downstream of the lake, Teoc and Potococowa Creeks, Ascalmore Creek-Tippo Bayou and Batupan Bogue enter the Yalobusha River before it combines with Tallahatchie River at Greenwood.

In the Delta section of the WRPA, the Big Sunflower River rises in Coahoma County, Mississippi, and flows southerly for over 200 miles before entering the Yazoo River. The principal tributaries of the Big Sunflower River are the Quiver, Hushpuckena, and Little Sunflower Rivers and Bogue Phalia. The Steele Bayou Basin extends from the northwestern end of Washington County, Mississippi, to the Yazoo River 10 miles north of Vicksburg, Mississippi. The main stem of Steele Bayou is formed at Swan Lake by the junction of flows from Main Canal and Black Bayou. The drainage basins of Big Sunflower River and Steele Bayou are separated by Deer Creek. The Will M. Whittington Auxiliary Channel

crosses the southeast section of the Big Sunflower River-Steele Bayou Basin and diverts a major portion of flood flow out of the Yazoo River near Silver City, Mississippi, and passes it down to reenter the Yazoo River near the mouth of Big Sunflower River.

Yazoo River is formed at Greenwood by the confluence of the Tallahatchie and Yalobusha Rivers. From Greenwood the river flows 169 miles to meet the Mississippi River at Vicksburg. Tributaries not mentioned in preceding paragraphs include Tchula Lake, Alligator-Catfish Bayou, and Bear, Pelucia, Big Sand, Abiaca, Chicopa, Fannegusha, and Black Creeks, and Rocky Bayou.

The quality of the rivers and streams in WRPA 4 is generally poor. Heavy silt loads and turbidity in the hills and delta and sparse bank cover in the delta give the streams a rather unpleasant appearance overall.

Man-made Canals

The only significant man-made waterway in WRPA 4 is the Will M. Whittington Lower Auxiliary Channel, which is designed to carry a portion of the flood flow in the main-stem Yazoo River from Silver City, Mississippi, to the mouth of the Big Sunflower River at its confluence with the Yazoo. The channel is 30.8 miles long with 61.3 miles of parallel levees and was completed in 1962.

There are many small channels in WRPA 4, primarily drainageways designed to remove runoff from agricultural lands.

Natural Lakes

The Delta area of WRPA 4 is a very delicately balanced hydrologic system built around a network of interlaced streams, oxbow lakes, and wetland or backwater areas. The water-land-life cycle within this network is responsive to a "domino" or chain reaction effect whereby pressure induced in one area directly or indirectly affects surrounding interdependent areas. This is in direct contrast to the upland area which is dominated by an internally independent system having a stable mixed pine-hardwood timber base and no natural lakes.

Most all the natural lakes in WRPA 4 are located in the delta, and all are integral parts of the oxbow system that dominates the alluvial area. Several thousand oxbow cutoffs, ranging in size from a few acres to over a thousand acres, are located in the delta, the greatest concentration being in Leflore County. The natural lakes in WRPA 4 have historically provided outstanding fishing, waterfowl hunting, skiing, and other recreational opportunities, but the overall integrity of the lakes has diminished in recent years due to pressure from bankside agricultural enterprises, sediment buildup, and injection of toxic municipal, industrial, and agricultural wastes.

The largest and one of the most important oxbow lakes in the delta is Lake Washington. This water body covers 5,000 acres and provides water-oriented recreation opportunities and waterfowl habitat. Other oxbow lakes highly rated by State biologists in terms of fishing and waterfowl use are Horseshoe Lake, 750 acres; Lake Bolivar, 1,200 acres; Eagle Lake, 4,700 acres; and Moon Lake, 2,200 acres. Natural lakes in the uplands are scarce and are found only in flood plains.

Man-made Impoundments

The U.S. Army Corps of Engineers has completed four major multiple-purpose reservoirs in WRPA 4. These projects serve the primary purpose of flood control, but the reservoir areas are open for public use and recreation, and extensive facilities have been developed for that purpose. In addition, overlook areas have been provided at the dam sites where visitors may view the lakes, the dams, the outlet works, and the river valleys downstream from the dams.

Sardis Lake, located on the Little Tallahatchie River northeast of Batesville, Mississippi, is the oldest of the four reservoirs. Public use facilities include three swimming beaches, 14 boat ramps, more than 350 camping units, and over 370 units for picnicking. A minimum conservation pool of 10,700 acres is maintained.

Enid Lake, on the Yocona River about 26 miles north of Grenada, Mississippi, provides a minimum conservation pool of 6,100 acres and public use facilities at more than a dozen sites. Grenada Lake, just northeast of Grenada on the Yalobusha River, is the largest man-made impoundment in the planning area (measured in terms of surface acreage of flood pool). It has a minimum summer pool of 9,800 acres and a swimming beach available for public use. It also has extensive public use facilities for camping and picnicking at 19 different sites scattered around the reservoir. Arkabutla Lake, northwest of Coldwater, Mississippi, is located on the Coldwater River. A minimum pool of 5,100 acres is maintained, and facilities have been constructed at nine different sites to provide for camping, picnicking, boating, and swimming.

There are a number of small reservoir projects being planned by the U.S. Soil Conservation Service under upstream watershed programs in WRPA 4. These projects are primarily for flood prevention, but at least one is multiple-purpose including recreation. In addition, the Soil Conservation Service has in years past constructed over 300 impoundments in the headwaters of many of the hill tributaries.

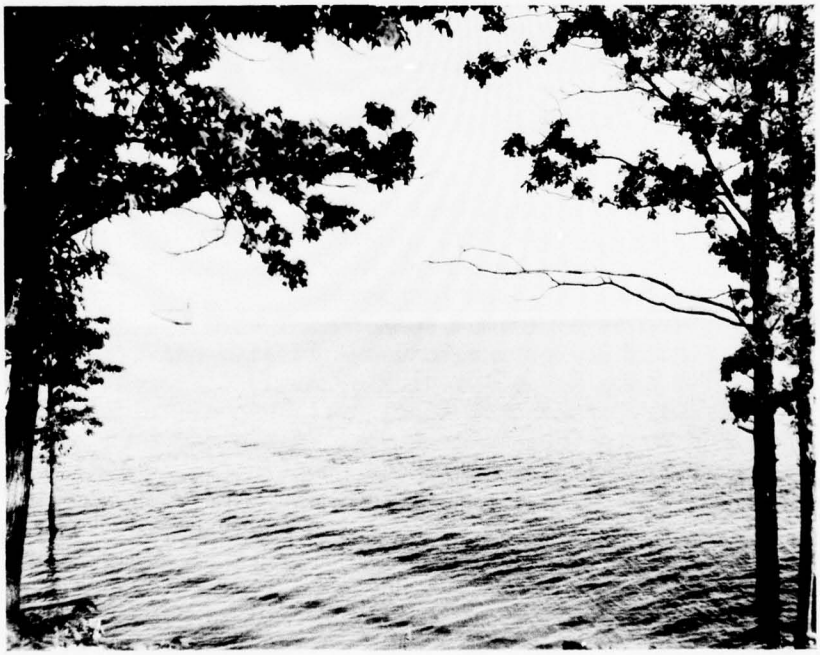
Water Use

Navigation in WRPA 4 is possible on the Lower Yazoo River only on an intermittent basis because of low flow periods. A 9-foot navigation depth is available 46 percent of the time from Greenwood to Vicksburg with a controlling depth of 4 to 9 feet the rest of the time.

On the main-stem Yazoo River, from Greenwood, Mississippi, to Vicksburg, Mississippi, 160 miles of channel work and 108 miles of parallel levees are complete. An additional 55 miles of channel work is authorized. On the Tallahatchie River, 18 cutoffs and 74 miles of channel modifications are complete, and future authorized construction includes one channel cutoff and 30 miles of levees. On the Little Tallahatchie River, 48 miles of channel work are complete.

On the Coldwater River portion of the main stem, 55 miles of channell modification (36 cutoffs) and 40 miles of levee construction are complete. Additionally, 32 miles of levees and 4.8 miles of channel construction on the Bear Creek diversion are authorized.

Authorized work on tributary streams (hills and delta) includes 459 miles of channel modifications and 159 miles of levees. To date, 244 miles of channel work and 22 miles of levees are complete.



In terms of surface acreage at flood pool, Grenada Lake, on the Yalobusha River, is the largest of the four Corps of Engineers reservoirs in WRPA 4

HISTORICAL BACKGROUND

Land Resources

The history of agricultural development in the uplands is generally one of land misuse, abuse, and decay, stemming primarily from poor conservation practices in the production of two "clean-tilled" row crops - cotton and corn. In the last 25 years, however, there has been some restoration and improvement in this condition.

The first white settlers came to the hills from Virginia and the Carolinas around 1800. They established an agricultural economy centered around corn and cotton production, and by the late 1930's more than 60 percent of the total farm population of the hills was dependent primarily upon cultivated land for cash earnings. As the flatter upland areas became overcrowded, farming was begun on the hillsides, exposing the loosely compacted sandy loam to the erosive forces of wind and water. Uncontrollable erosion followed; and farmers, in final desperation, deserted their farmsteads because they could not eke out a living on land unsuited for cotton or corn.

By the 1930's, a yearly average of 100 million tons of sand and sediment poured into the hill streams from land eroding at a rate of 200 tons per acre, causing damages in excess of $400 million annually. Sixty-five percent of the bottomland suffered from annual flood and sediment damage. Drainageways were so stifled that rains of less than 1 inch caused a dramatic reduction in both the quality and productivity of the forest resources. The hills were a virtual wasteland.

Beginning in 1944, Congress provided for Federal participation in planting trees, grasses, and legumes on the unprotected hillsides to retain the soil and reduce the magnitude and intensity of storm runoff. Between 1950 and 1970, almost 680 million loblolly pine trees were planted in the hills. Approximately 312,000 acres of grasses and legumes were planted in the same time period and thousands of brush dams were built to stop erosion, helping return extensive land acreage to beneficial agricultural production.

Today, much stability has been restored to the overall natural environment of the hills. The forestry base is still quite diversified, although extensive areas of pine monoculture have replaced the mixed pine-upland hardwood timber that was cleared by early agriculturists. The upland environment is internally independent; therefore, pressures induced in one area from endeavors such as land clearing do not affect surrounding areas as severely as such practices do in the delta.

In the delta, historical development has largely centered around the countless intermingled complexities of a single, continuing endeavor - land reclamation. Land reclamation has significantly altered

the natural hydraulic, terrestrial, and topographic aspects of the delta, causing a serious decline in the quality of the natural environment. Even so, an intricate system of oxbow lakes and associated "brakes" or "scatters" created by meander patterns of the Yazoo, Sunflower, Coldwater, Yalobusha, and Tallahatchie Rivers provides aesthetic diversity to the appearance of the delta and serves as an outstanding environmental support system for a wide variety of fish and wildlife.

In order to grow crops in the delta, the early settlers had to clear their farmland and construct earthen revetments to provide protection against fierce, damaging floods. In 1819, and again in 1846 and 1848, the State of Mississippi enacted legislation concerning levee building in the delta, which until 1848 was an almost impassable swamp with little habitation and virtually no farming, save for that on a few scattered patches of high ground that did not flood annually. As the Mexican War drew to a close in 1847, immigration to the delta increased sharply, primarily due to the promotional efforts of land companies.

In 1849 and 1850 the Federal Swamp Lands Acts were passed, thus bringing the United States Government into flood control and other aspects of land reclamation. Over 3 million acres of overflow swamp land were given to the State of Mississippi on condition that revenues from the sale of the land would be applied to flood control, land drainage, and related endeavors. Significant progress in flood control work was made in the late 1800's, but the 1927 deluge dispelled all feelings of false security in the Yazoo basin. The "levees only" concept, the only flood control technique employed to that time, was displaced by newer, innovative concepts involving reservoirs, floodways, bendway cutoffs, bank stabilization, and other structural measures.

Land drainage progressed simultaneously with flood control efforts. Drainage laws were passed by the Mississippi Legislature in 1886, 1900, and 1906 relating to swamp land districts established under the Federal legislation of 1850. Languishing drainage programs were spurred in 1944, when flood control was re-defined by Congress to include major drainage projects and improvements. With the new legislation, the Federal government became more actively engaged in projects not directly involving levee construction. Several major drainage works were subsequently included in the Federal projects in the delta.

Land clearing, which usually follows and is often induced by flood control and drainage improvements, was rapid from 1900 to the beginning of the first World War, but then tapered off sharply until the end of World War II. From 1935 to 1950, forest land in the delta decreased by 9 percent, leaving almost 37 percent forested acreage in 1950. In the 5 years prior to 1950, over 60,000 acres were clearcut. In the 4-year span preceding 1959, 88,000 additional acres were stripped, and forest land by then had decreased to about 32 percent of the total delta area. In total, clearing operations from 1945 to 1959 denuded over 310,000 acres of delta land.

Eagle Lake, an oxbow of the Mississippi River, is one of the most productive fishing lakes in WRPA 4

Six Mile Lake is typical of the many small oxbows which are vital components of the environmental base of WRPA 4

Water Resources

In both the hills and delta areas of WRPA 4, an economic exchange of scenic rivers and streams for man-made channels began with local agriculturists sometime in the middle 1800's. Stream channels choked by sediment were likely straightened or otherwise modified to improve their ability to convey flood water away from the vulnerable corn and cotton crops.

However, it was not until the early 1940's that federally financed projects for flood control began to appear in the area. One of the first, completed between 1942-44, consisted of hydraulic improvement of 64 miles of the Cassidy Bayou channel. In 1940 a dam across the Little Tallahatchie River in the hills was completed, forming Sardis Lake. Hardly more than a decade later, three additional major headwater reservoirs - Arkabutla, Enid, and Grenada, had been completed. Meanwhile, the hydraulic characteristics of the Tallahatchie, Yalobusha, and Yazoo Rivers had been improved through varying degrees of channel modification. Since that time, the natural characteristics of many additional rivers and streams in both the hills and delta areas of WRPA 4 have been altered - all with economic justification, but most with pronounced adverse impacts on some of the scenic, biological, or other components of the natural environment of WRPA 4.

SIGNIFICANT ENVIRONMENTAL FEATURES

Significant environmental features in WRPA 4 include essentially undeveloped landforms, water bodies, and forests. One of the most outstanding landforms is that portion of the Delta Hills Bluffs in Carroll and Holmes Counties, Mississippi. Significant water bodies include numerous aesthetically pleasing lakes, most of which are in the delta. Significant bottomland hardwood forests are scattered throughout the area. Scattered tracts of wetlands are associated with the stands of bottomland hardwoods and there are several unique ecological systems, such as McIntyre Scatters and Eagle's Nest, associated with the lake areas. There are, however, no significant beaches and shores in WRPA 4 other than those associated with natural inland lakes and man-made impoundments, and there is a general lack of open and green space in urban areas.

Open and Green Space

Out of a total of 328,000 acres of urban and built-up land in WRPA 4, there are less than 3,000 acres of essentially undeveloped, visually attractive natural areas strategically located where most needed to ameliorate intensifying urbanization patterns. This amounts to only one-hundredth of an acre per urban resident.

Scenic Rivers and Streams

None of the rivers and streams in WRPA 4 are known to possess outstanding scenic qualities or other characteristics contributory to the environmental quality objective. Whatever scenic beauty the waterways may have possessed in the past has largely been denied present resource users due to extremely heavy siltation, extensive channel modification works, and loss of bankside timber and vegetation due to encroaching agricultural operations.

Lakes

There are virtually no natural lakes in the upland area of WRPA 4. The delta, however, has innumerable natural lakes, most of them oxbow cutoffs created by sluggish, meandering alluvial streams. Many of these lakes and their associated timber brakes or backwater areas have long, enviable histories of fishing and hunting excellence. McIntyre Scatters, Matthews Brake, Sharkey Bayou, Mossy Lake, Eagle Lake, Wolf Lake, and hundreds of other similar water bodies, many of which are listed in the environmental needs tables for WRPA 4, are vital components of the delta oxbow system.

Wilderness Areas

The only recognized wilderness area in the WRPA is the Delta National Forest located along the lower end of the Big Sunflower River. Otherwise, the only area closely resembling a wilderness is McIntyre Scatters, an extensive backwater area adjoining McIntyre Lake, north of Greenwood. The only area having truly extraordinary wildlife is Eagle's Nest near Swiftown, where a large colony of alligators imported into the local swamp many years ago thrives today.

Wetlands

Closely associated with, and critically important to, the delta resource base are the tracts of wetlands such as undisturbed marshes, swamps, and overflow bottomland hardwood forests. These areas provide nursery and breeding grounds for the fishery and wildlife that depend upon the swampy ecosystem for food and shelter. Squirrel, whitetail deer, wild turkey, rabbit, and many game species of waterfowl and fish reside in the delta lowlands and lakes.

Bottomland Hardwoods

The 1,148,000 acres of bottomland hardwoods and associated wetlands in WRPA 4 are scattered throughout the area in major stands ranging in size from about 25,000 acres to 265,000 acres. The present hardwood resource is such that 8 or more acres out of every 10 acres will likely change status within the next 50 years if measures are not taken to modify present trends.

Unique Geological Systems

The only recognized unique geological system in the WRPA is a 1,055-acre portion of the Delta Hills Bluffs. This area in Carroll and Holmes Counties, Mississippi, can through observation and study contribute to man's knowledge and appreciation of his physical environment.

Unique Ecological Systems

The Sharkey Bayou Area, Beckham Swamp, Ashland and Gayden Brakes, and several additional areas represent ecological systems in the WRPA. The interdependent physical and biotic environments of these systems possess intrinsic values and contribute to the enrichment of the general quality of life of people living in or visiting WRPA 4.

McIntyre Scatters, an extensive tract of wetlands, swamp, and bottomland hardwoods, is one of the most significant environmental features in the region

Bottomland hardwoods and wetlands are rapidly disappearing in WRPA 4 as agricultural operations expand

MAJOR ENVIRONMENTAL PROBLEMS

Land

Past impacts of land reclamation in the upland area are less critical than those in the delta, primarily due to topographical conditions and limitations. The hill section is simply not ideally suited to large-scale agricultural operations although farming is practicable on a reduced basis. Although the timber resource remains fairly balanced, land clearing in the hills is being practiced to convert woodland to pasture more so than in the delta. The Soil Conservation Service indicates that a gradual resurgence in land clearing of approximately 4 percent per year is in evidence in the hills, due primarily to increased livestock production.

In order to retard critical erosion in the upland areas of WRPA 4, millions of pines have been planted as part of a massive land stabilization program

The land restoration and stabilization program in the hills is approximately 90 percent complete. The "restored" environment, however, is dissimilar to the original, particularly regarding woodland. The upland hardwood and mixed pine-hardwood timber which was initially cleared has been replaced in many areas throughout the region by a pine monoculture. This is due to the faster growth characteristics, higher potential economic yield, better soil stabilization properties, and

Land clearing and subsequent cultivation to the banks of streams and lakes in WRPA 4 is a major cause of erosion, declines in water quality, loss of wildlife and fishery habitat, and other adverse environmental impacts

Drainage of wetlands through ditching and stream channelization is one of the most serious problems in WRPA 4

other advantages that pines evidence over hardwood species. Unfortunately, the wildlife support capability of the new pine-based ecosystem in the hills is significantly inferior to the original hardwood habitat which provided a diverse food chain and abundant nesting cover for such game species as squirrel, deer, turkey, and rabbit.

The overall condition of the natural environment in the delta is poor. Large scale land clearing, which increases sediment and erosion problems and detracts from scenic diversity, continues. Land clearing trends are explainable by the mere fact that delta agriculturists earn a much higher rate of return from their land if it is committed to crops - cotton and soybeans, primarily - than they do if the land is left in its natural state.

Without timber tracts to add diversity and balance to the landscape, the delta, in places, can become a barren, desolate plain, particularly in winter. Restoration of timber to particular areas is gradually increasing, however, in an effort to reestablish windbreaks and create habitat for small game.

Water

A major environmental problem of the hills is the loss of integrity and vitality of many streams and rivers. Degradation of fluvial systems in the uplands has been caused by natural sedimentation, reservoir construction, and channel modification. Attempts to alleviate flooding problems have altered the natural appearance and viability of small streams and rivers, and channel modification to remove bed deposits of sediment has seriously lowered the aesthetic appearance of numerous tributaries.

In the uplands, there are approximately 11,400 miles of streams; approximately 1,700 miles have been altered by the works of man. The environmental impact of most of the stream alteration is exemplified in part by what has happened on the Tippah River. When 60 miles of initial channel work on this stream was completed in the early 1960's, the fish population was reduced from 240 pounds per acre to 5 pounds per acre. In 1971, the fish population had revived only slightly to 16 pounds per acre, but the dominant species at present are minnows, gizzard shad, and forage fish. Few game fish are regularly caught.

Loss of stream fishery and associated wildlife habitat resulting from stream channelization is most serious in the hills because of the scarcity of natural lakes. Without the streams, little opportunity for fishing and water-oriented outdoor activities, other than that provided by man-made impoundments, is available.

The greatest environmental problem in the delta is the decay of oxbow lakes. Many of these lakes, now severed from the main streams

Many streams in both the upland and alluvial areas of WRPA 4 have been seriously degraded by sediment buildup

Declines in the overall quality of natural lakes in WRPA 4 are attributable in large measures to excessive, improper use of agricultural chemicals and poor land use practices

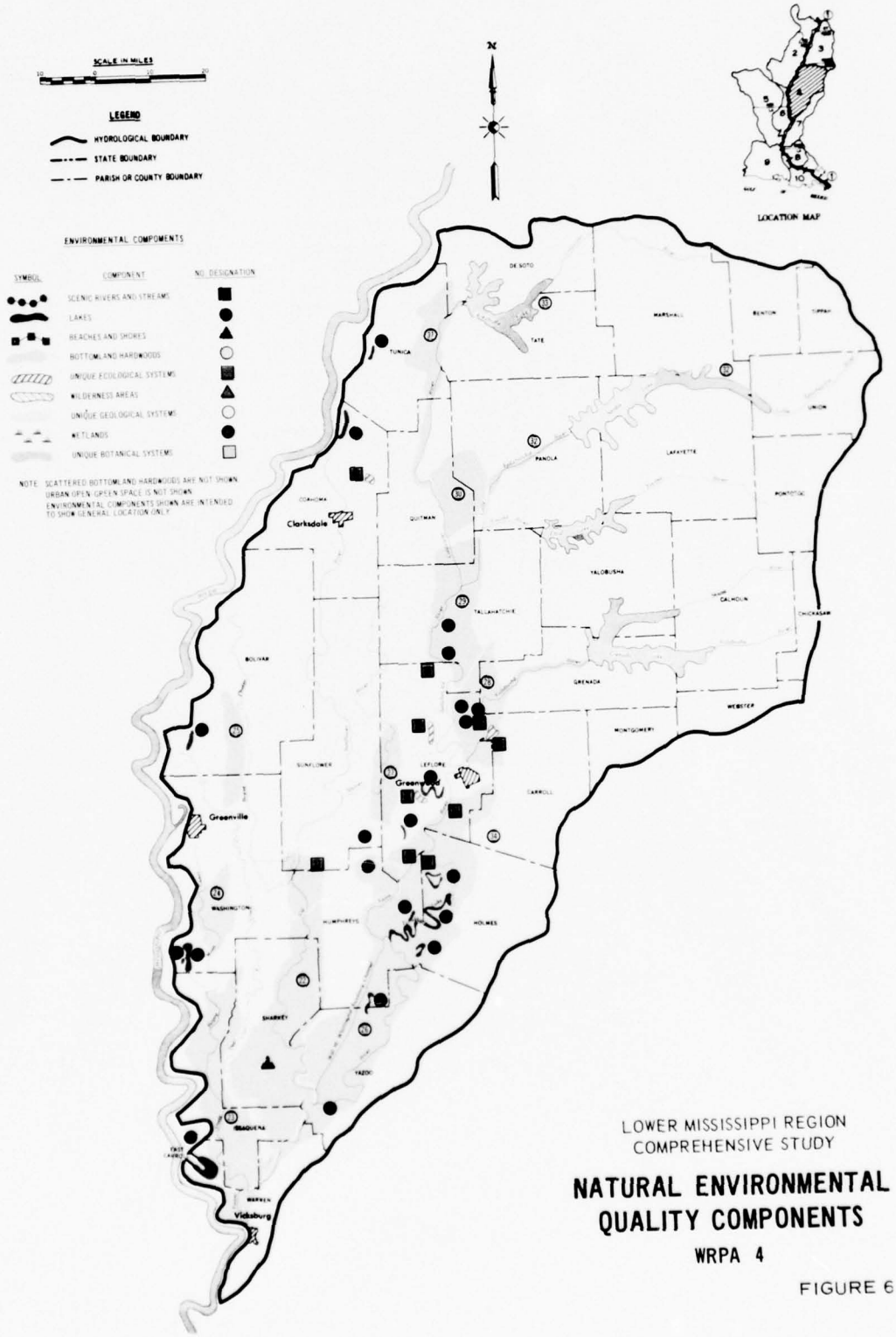
and receiving little high-water flushing, have become isolated stagnating sumps in the middle of cotton or soybean fields. Agricultural operations encroach upon banks of the lakes and very little, if any, peripheral vegetation is present in some areas to act as a filter for surface runoff.

In 1964, 244,580 tons of fertilizer were applied to 1,616,569 acres of land in WRPA 4, thus creating a potent source of nutrients for water bodies in the planning area. Heavy and in many instances poorly managed use of these fertilizers, herbicides, and pesticides has contributed to the problems of both the streams and oxbow lakes. In 1971 the Mississippi Game and Fish Commission officially closed both Mossy and Wolf Lakes to commercial fishing due to excessive levels of DDT in the flesh of fish and invertebrates in the lakes. Also, in 1973 Lake Washington was closed to commercial fishing for the same reasons. Previously, these lakes had provided some of the finest sport fishing in the region. The overall degradation of the oxbow lakes, if left unabated, will inevitably spell doom to this type of fishery habitat in the delta.

Extensive land clearing in the delta has contributed significantly to water problems. As vast acreages of timber, particularly wetland species, are removed, associated water bodies tend to decline through increased exposure to sediment and chemical-laden surface runoff from adjacent fields. In some instances, lakes immediate to fields being treated by aerial application of chemicals have been used as dumping or purge points for excess toxic sprays and dusts.

ENVIRONMENTAL NEEDS

Continued and uncontrolled development of the water and land resources of WRPA 4 can have irreversible effects on the natural lakes and bottomland hardwood forests. Overdevelopment of the shorelines of the lakes, for instance, can serve to destroy their intrinsic scenic beauty which cannot be fully restored. Likewise, the natural stands of bottomland hardwoods, once eliminated by agricultural or other pursuits, cannot be fully restored or retrieved within the time span of human experience of present generations. Hence there is a need for present resource users to take positive short-term actions to preserve freedom of choice for future resource users. These actions should include by 1980 the protection of approximately 200,000 acres of bottomland hardwoods, and the protection of 21 scenic lakes and their sparsely developed shorelines. They should also include protection of the Delta Hills Bluffs, possible preservation of 10 unique ecological systems, and the creation of about 8,000 acres of open and green space in urban areas. Natural environmental quality objectives for WRPA 4 are located in figure 6 and are quantified in table 5.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 4

FIGURE 6

TABLE 5. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 4

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Scenic Rivers and Streams					
	None					
	Lakes[1]	Acres[2]	(21,623)	(17,153)	(4,470)	
1	Eagle Lake	Acres	4,900	4,700	200	8 miles of sparsely developed shoreline (acquire 200 acres which is a 200-ft strip along shore).
2	Big Mossy Lake	Acres	375	0	375	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
3	Six Mile Lake	Acres	185	0	185	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
4	Grassy Lake	Acres	65	0	65	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
5	Beaver Dam Lake	Acres	775	700	75	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
6	Bolivar Lake	Acres	1,300	1,200	100	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
7	Tchula Lake	Acres	610	0	610	6 miles of sparsely developed shoreline (acquire 145 acres which is a 200-ft strip along shore).
8	Horseshoe Lake	Acres	825	750	75	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
9	Macon Lake	Acres	65	0	65	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
10	Hampton Lake	Acres	140	0	140	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
11	Bee Lake	Acres	475	0	475	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
12	Jackson Lake	Acres	425	0	425	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
13	Dump Lake	Acres	515	0	515	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
14	Moon Lake	Acres	2,320	2,200	120	5 miles of sparsely developed shoreline (acquire 120 acres which is a 200-ft strip along shore).
15	Roebuck Lake	Acres	680	580	100	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
16	Wolf Lake	Acres	798	723	75	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
17	McIntyre Lake	Acres	700	600	100	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
18	Robinson Bayou	Acres	275	0	275	3 miles of sparsely developed shoreline (acquire 75 acres which is a 200-ft strip along shore).
19	Washington Lake	Acres	5,120	5,000	120	5 miles of sparsely developed shoreline (acquire 120 acres which is a 200-ft strip along shore).
20	Little Eagle Lake	Acres	725	700	25	1 mile of sparsely developed shoreline (acquire 25 acres which is a 200-ft strip along shore).
21	Sky Lake	Acres	350	0	350	4 miles of sparsely developed shoreline (acquire 100 acres which is a 200-ft strip along shore).
	Bottomland Hardwoods	Acres	(1,147,600)	(947,000)	(200,600)	
22	Big Sunflower-Little Sunflower Area	Acres	155,000	127,900	27,100	Gross needs estimated as 100% of total area of 155,000 acres in forest measured from 1:250,000 scale map dated 1960.
23	Steele Bayou Area	Acres	130,000	107,300	22,700	Gross needs estimated as 100% of total area of 130,000 acres in forest measured from 1:250,000 scale map dated 1960.
24	Black Bayou Area	Acres	46,500	38,400	8,100	Gross needs estimated as 100% of total area of 46,500 acres in forest measured from 1:250,000 scale map dated 1959.

TABLE 5. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 4
(CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Bottomland Hardwoods (Continued)					
25	Clear Creek Area	Acres	25,000	20,600	4,400	Gross needs estimated as 100% of total area of 25,000 acres in forest measured from 1:250,000 scale map dated 1959.
26	Yazoo River Area	Acres	265,000	218,700	46,300	Gross needs estimated as 100% of total area of 265,000 acres in forest measured from 1:250,000 scale map dated 1960.
27	Quiver River Area	Acres	26,500	21,900	4,600	Gross needs estimated as 100% of total area of 26,500 acres in forest measured from 1:250,000 scale map dated 1959.
28	Ascalmore Bayou-Yalobusha River Area	Acres	76,500	63,100	13,400	Gross needs estimated as 90% of total area of 85,000 acres in forest measured from 1:250,000 scale map dated 1959.
29	Tallahatchie River Area	Acres	86,000	71,000	15,000	Gross needs estimated as 100% of total area of 86,000 acres in forest measured from 1:250,000 scale map dated 1959.
30	Bobo Bayou Area	Acres	46,500	38,400	8,100	Gross needs estimated as 100% of total area of 46,500 acres in forest measured from 1:250,000 scale map dated 1961.
31	Coldwater River Area (Lower)	Acres	58,000	47,900	10,100	Gross needs estimated as 100% of total area of 58,000 acres in forest measured from 1:250,000 scale map dated 1961.
32	Little Tallahatchie R. Area	Acres	43,200	35,600	7,600	Gross needs estimated as 90% of total area of 48,000 acres in forest measured from 1:250,000 scale map dated 1960.
33	Coldwater River Area (Upper)	Acres	26,100	21,500	4,600	Gross needs estimated as 90% of total area of 29,000 acres in forest measured from 1:250,000 scale map dated 1960.
	Others (Scattered)	Acres	163,300	134,700	28,600	
	Unique Geological Systems					
34	Delta Hills Bluffs[3]	Acres	1,055	0	1,055	Bluff line, Carroll and Holmes Counties - 300-ft strip, 29 miles long - Pelucia Creek to Black Creek.
	Wetlands					
	Included in Bottomland Hardwoods					
	Unique Ecological Systems[4]	Acres	(9,800)	(0)	(9,800)	
35	Sharkey Bayou Area	Acres	2,500	0	2,500	
36	Matthews Brake	Acres	700	0	700	
37	Dutch Brake	Acres	650	0	650	
38	Blue Lake Brake	Acres	750	0	750	
39	Ashland Brake	Acres	1,000	0	1,000	
40	Beckham Swamp	Acres	1,000	0	1,000	
41	Gayden Brake	Acres	1,100	0	1,100	
42	Eagle Brake	Acres	900	0	900	
43	Alcorn Brake	Acres	800	0	800	
44	McIntyre Lake Area	Acres	400	0	400	
	Wilderness Areas					
45	Delta National Forest[4]	Acres	5,000	0	5,000	
	Urban Open and Green Space	Acres	8,000	0	8,000	
	Total Land, All Components	Acres	(1,156,655)	(947,000)	(209,655)	
	Forests					
	Bottomland Hardwoods		1,147,600	947,000	200,600	
	Other Forests		1,055	0	1,055	Delta Hills Bluffs
	Pasture		0	0	0	
	Urban		8,000	0	8,000	
	Other		0	0	0	
	Total Water, All Components		(19,900)	(17,200)	(2,700)	
	Large Water		19,900	17,200	2,700	
	Small Water		0	0	0	

1/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.
2/ Includes water surface area and/or land area along shore.
3/ Forest other than bottomland hardwoods.
4/ Included in bottomland hardwoods category.

W R P A 5

ENVIRONMENTAL SETTING

General

WRPA 5 is the largest planning area, covering about 13.1 million acres or about 20 percent of the region's area. Roughly 59 percent of WRPA 5 lies within the State of Arkansas, with the remaining 41 percent in Louisiana (figure 7). Water covers approximately 251,000 acres of the area, while the remaining 12.8 million acres are land.

The major drainage basins within the planning area are the Ouachita River Basin and the Lower Red River Basin below Hot Wells, Louisiana. Principal tributaries of the Ouachita River are the Caddo, Little Missouri, and Saline Rivers. The principal tributary of the Lower Red River is the Little River. The planning area lies within parts of four different physiographic provinces: the Ouachita Mountains, Southern Hills, Western Hills, and the Alluvial Valley.

Land Forms

The land forms of WRPA 5 range from nearly level land to rolling hills, to rugged mountains. More specifically, the area can be divided into three distinct topographic sections: the mountain, hill, and delta sections.

The mountain section comprises about 15 percent of the total area and lies in the upper reaches of the Ouachita River and its tributaries. This section extends from around Malvern, Arkansas, to the headwater areas of the basin. The terrain is very rugged and consists of parallel ridges separated by deep valleys, with elevations ranging from 400 to 2,000 feet. Most of the area is timbered, except for small valley areas which are farmed.

The hill section extends along the main stem of the Ouachita River from Malvern, Arkansas, to an area in the vicinity of Calion, Arkansas. This section, which comprises over half of the WRPA, is rolling and hilly land except for the flat bottoms along the river. Elevations range from 500 feet in the uplands to about 100 feet in the broad flood plains.

In the area below Calion, Arkansas, the Ouachita River enters the alluvial valley of the Mississippi River and traverses bottomlands dissected by numerous swamps, lakes, and bayous. This large low-lying depression, approximately 80 miles in length, extends to the vicinity of Sterlington, Louisiana, and includes an upland ridge known as the Bastrop Hills. These hills, located near Bastrop, Louisiana, are

17 miles long and a little over 5 miles wide at the widest point. They rise as much as 70 feet above the adjacent flood plain, and are separated from the western valley wall by a gap occupied by Bayou Bartholomew and the Ouachita River.

Below Sterlington, the delta section extends to the mouth of the Black River, with a hill area on the western edge of the basin. Below the vicinity of Columbia, Louisiana, the Ouachita lies within the Red River backwater area. In this area, the topography is generally of low relief with surface elevations averaging 35 to 40 feet in the swamp lands. However, there is one significant upland area known as Sicily Island. This area, like several of the upland fragments in the Atchafalaya and other basins, is an isolated circular highland approximately 5 miles in diameter. It rises 200 feet above the flood plain and is separated from the western valley wall by the 1.5 mile wide flood plain of the Ouachita River.

Land Use

Approximately 10.2 million acres (80 percent) of WRPA 5 are forested; this represents 25 percent of the forest land in the Lower Mississippi Region.

Agricultural land in cropland and pasture accounts for 15 percent of the land in the planning area. Approximately 732,000 acres are classified as cropland and 1.2 million acres are classified as pasture land.

Urban and built-up areas account for 3 percent of WRPA 5, and the remaining 2 percent is in other miscellaneous uses.

Water Bodies

Rivers and Streams

The major rivers in WRPA 5 are the Ouachita-Black, Caddo, Little Missouri, Saline, and Little Rivers, and Bayous Bartholomew, Corney, and D'Arbonne. Of these, only the Little River and Bayou Bartholomew are free-flowing streams throughout their entire length. These major rivers and their tributaries are used to varying degrees for recreation, water supply, and fish and wildlife purposes. The Ouachita is also used for commercial navigation and it supplies cooling water for four steam plants.

The Ouachita River rises in the Ouachita Mountains near Mena, Arkansas, and flows through rugged terrain about 160 miles eastward through three man-made reservoirs to the vicinity of Malvern, Arkansas. It then flows southerly for about 95 miles through hilly upland areas to Camden, Arkansas, and then extends southeasterly about 132 miles

Although the Ouachita River has been extensively developed to provide navigation, power generation, and other benefits, many reaches of the stream remain very attractive and unspoiled

through wide bottoms in a hilly terrain, and southerly 224 miles through the alluvial valley of the Mississippi River to its junction with the Red River. The southernmost 57 miles of this river system are known as the Black River.

The Ouachita River and its tributaries all begin as small rocky or gravel-bottomed mountain streams which descend rapidly to the lower elevations. Most of the streams remain rock or gravel-bottomed, but they soon develop little alluvial flood plains along portions of their upper reaches. These little flood plains on the upper reaches are subject to flooding and are too narrow for farming, but most of them are very fertile and contribute substantially to game and other wildlife populations in the area. Some of the wider flood plains have been cleared for minor farming operations.

The natural channel of the Ouachita-Black River has been modified in varying degrees to provide a navigable depth of 6-1/2 feet at low water from the mouth in Louisiana up to Camden, Arkansas, a distance of 351 river miles. The channel depth is maintained by the operation of six locks and dams, by dredging, and the removal of logs, wrecks, overhanging trees, etc. The removal of navigation obstructions from the river for another 66 miles upstream to Arkadelphia, Arkansas, has been authorized by Congress. In addition, Congress has authorized the modification of the existing project to provide a minimum 9-foot navigation

depth from the mouth of the Red River (35 miles downstream from the junction of Black River and Red River) to Camden, Arkansas. The modification involves the replacement of the six obsolete structures by four new locks and dams.

One of the new structures, recently completed, will include facilities for the diversion of flows from Catahoula Lake into Black River downstream from the lock and dam. This feature will allow for regulation of stages in the lake to permit its continued use as a wildlife refuge and resting and feeding area for migratory waterfowl. Another of the new structures will have a pool superimposed on top of the navigation pool to maximize fish and wildlife benefits.

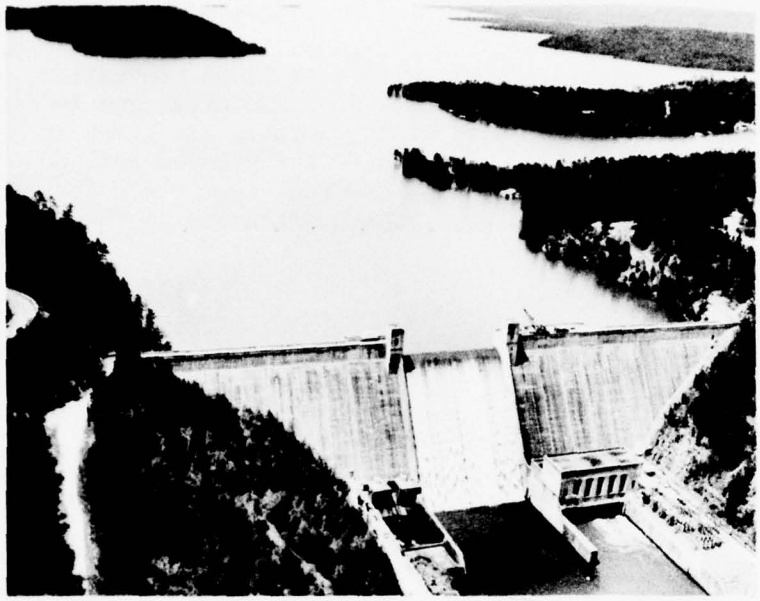
Natural Lakes

Catahoula Lake is the largest natural lake in WRPA 5. It covers 30,730 acres, provides water-oriented recreation, good fishing, and has extremely high waterfowl use of national importance. The only other natural lakes of any appreciable size are Larto Lake and Glasscock Lake. The first is a Red River oxbow covering about 2,200 acres, and the second is a Mississippi River oxbow covering 1,500 acres. Both provide recreation and fishing, and receive waterfowl use of local significance. Glasscock Lake is physically located within WRPA 1, but its facilities are shared with WRPA 5.

Man-made Impoundments

Several large lakes serving the primary purposes of recreation and fish and wildlife have been constructed throughout the planning area by the States of Arkansas and Louisiana. These include Calion Lake, 500 acres; Cox-Creek Lake, 306 acres; Tri-County Lake, 280 acres; and White Oak Lake, 2,600 acres. Other lakes administered by local commissions for the same purpose include Bayou D'Arbonne Lake, 15,241 acres; Corney Lake, 1,920 acres; Lake Claiborne, 6,400 acres; and Lake Winona, 5,520 acres. In addition, the Arkansas Power and Light Company administers the use of its two large reservoirs - Lake Catherine, 3,000 acres; and Lake Hamilton, 5,200 acres - for recreation and fish and wildlife purposes. The Power Company lakes add considerable interest to the terrain near Hot Springs. Details can be found in Appendix D, Inventory of Facilities.

The U.S. Army Corps of Engineers has completed three major multiple-purpose reservoirs in WRPA 5. Lake Greeson on the Little Missouri River and Lake Ouachita on the Ouachita River serve the primary purpose of flood control and hydroelectric power. DeGray Lake on the Caddo River has combined storage for flood control, generation of hydroelectric power, water supply, and pollution abatement. Aside from these primary purposes, the reservoir areas of the Corps projects are open for public use and recreation. Overlook areas have been provided at the dams where visitors may view the lakes, the dam, the outlet works, and the river valleys downstream from the dams.



Narrows Dam impounds Lake Greeson, one of three Corps of Engineers multiple-purpose reservoirs in WRPA 5

Lake Greeson is located about 5 miles from Murfreesboro, Arkansas, and a minimum pool of 7,200 acres is maintained during the prime recreation season. Public use facilities for camping, picnicking, and related activities have been partially completed at 20 sites around the reservoir, and have been authorized for installation at 7 additional sites. The Daisy State Park (370 acres) on the eastern shore of the reservoir is administered by the Arkansas Parks, Recreation and Travel Commission, for the primary purpose of recreation and fish and wildlife conservation.

Lake Ouachita, near Hot Springs, Arkansas, has a minimum summer pool of 40,100 acres available for recreation purposes. Public use facilities in addition to scenic overlook sites at the dam and spillway have been partially completed at 20 sites, and future facilities have been authorized at additional sites.

DeGray Lake, just north of Arkadelphia, Arkansas, includes facilities to withdraw water from three different elevations in the lake to provide water temperatures beneficial to fish in the downstream portion of the river. A pool of 13,400 acres is maintained during the prime recreation season. Public use facilities for camping, picnicking, boat launching, etc., have been authorized at 24 sites and were under construction at 7 of those sites in 1972.

There are a number of small reservoir projects being planned by the U.S. Soil Conservation Service under upstream watershed programs in WRPA 5. These projects are primarily for flood prevention, but some are multiple-purpose, including recreation, municipal and industrial water, and fish and wildlife mitigation (details are given in Appendix D, Inventory of Facilities). In addition to the planned Soil Conservation Service flood prevention reservoirs, numerous farm ponds for livestock water or recreation (fishing) have been constructed in the WRPA.

HISTORICAL BACKGROUND

Land Resources

WRPA 5 is geographically characterized by hills, and further characterized by vast timber resources, including logs and pulpwood, with both hardwoods and softwoods to be found in commercial quantities. These physical phenomena have been elementary factors in the economy and land use patterns that have developed over the years. Crops have been cultivated in the area for many centuries, but in general the area is economically dominated by the forestry industry, around which major agricultural activities have centered for the last century. Industrial activities aside from those concerned with timber resources have historically been concerned with the basic products of the mineral resources.

Development and use of the area's native natural resources and raw materials by Europeans began with the arrival of pioneer settlers in the late 1600's and early 1700's. By 1716 the first crude sawmills were put into operation. These were called "pit saw" or whip saw mills because one man stood in a pit below to pull the saw down while a man on top pulled the saw up.

After the turn of the 19th Century, many mechanical changes were made in the sawmill business. The pit saw gave way to the newly developed sash saw and this, in turn, gave way to the gang saw which could cut several boards at the same time. Steam-powered sawmills were built after 1840.

But even with the technological advances, the lumber market was developed slowly due to a lack of capital for investment, a lack of a readily available labor force, and a lack of cross-country transportation. Because of transportation and marketing reasons, most lumbering prior to the Civil War was accomplished along the rivers; and before 1860 the pine had been cut within a 2-mile strip along major rivers and tributaries, skidded to the river banks, and floated or rafted toward markets.

Abundant cross-country transportation facilities and equipment for overhead skidding were developed during the years following the Civil War. This led to the lumber industry's "Golden Era" that lasted through the first 4 decades of the 20th Century. Those were the days of the big sawmills that cut the virgin timber of the WRPA, leaving thousands of acres of cutover lands, ghost towns, unemployment, and depression years during the late 1930's. Subsequently, small hill farms reverted to forests.

Demands for timber during World War II required cutting anything that was left over from the big sawmills. Many small portable mills

sprang up to cut 2x4's and other small dimension lumber wherever timber could be found. This not only filled the war demands, it resulted in cutting millions of feet of cull timber which was made into useful products. As a by-product, it cleared from the land undesirable growth and trees that could never have been harvested economically under normal conditions.

The past quarter-century has been an era of reforestation, putting thousands of acres of previously cleared land back into trees. Industries have practiced intensive management of their forest lands to insure permanent supplies of timber. Consequently, forest acreage in WRPA 5 has grown modestly, but steadily, adding over 450,000 acres since 1949. This growth has been primarily in pine forests. The hardwood acreage has been steadily decreasing, due to the practice of clear cutting and planting to pine, to the poor economics of growing hardwoods timber, and to expanding agricultural operations. However, a beginning of hardwood management has been made.

The cultivation of crops, although important to the economy of WRPA 5, has been and is of secondary importance to the forestry industry. Mature soils, like those found in the hill section of the planning area, are of limited productivity. Much rain, combined with high temperatures, brings about leaching out of soluble plant foods and therefore the resulting soils cannot be continuously cropped without the addition of fertilizer. Consequently, the number of farms in the area has decreased, although the average acreage per farm has increased. Between 1949 and 1964, the total cropland in WRPA 5 declined steadily. More recently, however, new plantings of soybeans and wheat have generated a modest upturn in crop acreage. Similarly, there is an overall trend toward increasing acreage in permanent pasture land.

Water Resources

Water was the chief means of transportation for pioneer settlers in WRPA 5, and most of the early settlements were therefore located along the area's rivers and streams. One of the earliest settlements was Monroe, Louisiana, founded on the bank of the Ouachita River in 1787. Since then, the Ouachita has been an important navigation route and has been extensively improved for that purpose. The first improvements were authorized by the U.S. Congress in 1871. Subsequent improvements, which now provide for navigation from the mouth of the Black River in Louisiana upstream to Camden, Arkansas, were described earlier in this WRPA summary.

Over the years, the modification of the Ouachita-Black River system for navigation has been accompanied by the construction of water resources projects for flood control and drainage. One of the first flood control projects consisted of a loop levee constructed in the

early 1930's to protect the West Monroe area. In the same decade, a levee system was constructed for flood protection at Columbia, Louisiana. Additional levee systems at Bawcomville, Jonesville, and Pineville, Louisiana, and at Calion, Arkansas, were constructed during the 1950's. Other flood control projects, including levees and reservoirs, have been installed since that time and extensive channel modification works have been constructed or planned by State and Federal agencies.

The extent to which the existing water resource projects may have affected the quality of the natural environment has generally not been subjected to close examination, nor can such effects be quantified here. Potential projects, however, must be scrutinized from this standpoint, and any adverse effects taken into account.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Significant environmental features in WRPA 5 include essentially undeveloped landforms, water bodies, and forest. The landforms offer a diversity of unique geological systems, of which the most outstanding is a diamond mine located in Arkansas. Significant water bodies include numerous aesthetically pleasing lakes and scenic rivers and streams. Significant forests are mostly bottomland hardwoods with associated wetlands. In addition to these features, there are unique botanical and ecological systems and wilderness areas. There are, however, no significant beaches and shores other than those associated with the inland lakes and man-made impoundments, and sand bars along streams, and there is a general lack of open and green space in urban areas.

Open and Green Space

Out of a total of 440,000 acres of urban and built-up land in WRPA 5, there are less than 3,000 acres of essentially undeveloped, visually attractive natural areas strategically located where most needed to ameliorate intensifying urbanization patterns. This amounts to less than one-hundredth of an acre per urban resident.

Scenic Rivers and Streams

In general, the numerous mountain streams and surrounding mountains in WRPA 5 are beautiful terrain features. Ten streams in WRPA 5 have been singled out and officially recognized by the State of Louisiana as possessing outstandingly remarkable scenic features. These include Bayou Cocodrie, Bayou Bartholomew, Bayou D'Loutre, Corney Bayou, Bayou D'Arbonne, Middle Fork of Bayou D'Arbonne, Trout Creek, Little River, Big Creek, and Fish Creek. Portions of these streams, collectively totaling 274 miles, have been included in the Louisiana Natural and Scenic Rivers Act to provide for their maintenance and enhancement as a source of present enjoyment and a heritage for future generations. Other scenically attractive streams in the WRPA include the Saline River, Ouachita River, Moro Creek, Chemin-A-Haut Creek, Saline Bayou, Cypress Creek, and Choudrant Creek.

Lakes

There are numerous aesthetically pleasing lakes which contribute to the quality of human experience in WRPA 5. These lakes, whose scenic setting and sparsely developed shorelines are of special interest,

include Catahoula, Grand Marais, Fish, Mossy, Pereogeethe, Eagle, Benjamin, Mustin, Champagnolle, Little Bay, and Black Bayou Lakes. Of these, Catahoula is the largest (30,730 acres) and has, in addition to its outstanding scenic features, an extremely high waterfowl use of national importance.

Catahoula Lake, covering 30,730 acres, is the largest natural lake in WRPA 5

Wilderness Areas

Pristine areas of natural splendor and scientific interest can be found at five locations in WRPA 5. These include the Felsenthal Basin, Dismal Swamp, Seven Devils Swamp, and areas in the Ouachita and Kisatchie National Forests. There are many roads through the Ouachita National Forest and through other portions of the mountains and tablelands which are suitable for scenic drives.

Wetlands

Wetlands such as undisturbed marshes, swamps, and overflow lands are generally found in conjunction with bottomland hardwood forests in WRPA 5. Such lands support diverse life forms of scientific interest.

Bottomland Hardwoods

Approximately 2,361,000 acres, or 18 percent, of the total land area of WRPA 5 are covered by bottomland hardwood forests. These forests are found mostly in the relatively narrow flood plains of the larger streams, such as the Saline, Ouachita, and Little Missouri Rivers. However, they are also found in isolated areas along the smaller streams such as Bayou Bartholomew. The hardwood forests provide a haven for wildlife, retard surface runoff, enhance the replenishment of groundwater resources, and reduce flood peaks. They also retard soil erosion, thereby reducing the magnitude of sediment loads annually carried into the rivers and streams.

Because of their commercial value, the bottomland hardwood forests are being rapidly depleted; moreover, their present ownership and management are such that the bulk of them could be irreversibly depleted within the 50-year time frame of this study.

Unique Geological Systems

The only source of diamonds on the North American continent is a mine in the Arkansas portion of WRPA 5. This unique geological system is but one of many to be found in this planning area. Others include a salt mine in Louisiana, hot mineral springs in Garland County, Arkansas, and the Magnet Cove Crater, which is a volcanic remnant that yields many minerals not available anywhere else in the region. They also include the Winnfield Marble Rock Quarry, chalk deposits, Masley's Bluff, Sicily Island, Jordan and Driscoll Mountains, and others. The preservation of resources such as these can contribute to man's knowledge and appreciation of his physical environment.

Unique Botanical Systems

Unusual plant communities can be found in the upland hills area of WRPA 5, and unusual cypress knee formations can be found in the Catahoula Lake area. The opportunity to observe and study these natural botanical resources can lead to an enlarged understanding and appreciation of the natural world as the habitat of man.

Unique Ecological Systems

Catahoula Lake, Seven Devils Swamp, and a natural spring in the northeast corner of Jackson Parish, Louisiana, represent ecological systems whose interdependent physical and biotic environments possess intrinsic values and contribute to the enrichment of the general quality of life of people living in and visiting the Lower Mississippi Region.

WRPA 5 is geologically rich, having several unusual mineral deposits (above) and the only source of diamonds on the North American Continent (Crater of Diamonds State Park, Arkansas, below)

MAJOR ENVIRONMENTAL PROBLEMS

Land

There are many problems related to forest lands in this WRPA. One of the most important problems is the low stumpage price paid for pulpwood. The price paid for pulpwood stumpage has remained the same for almost 20 years, whereas during the same period the price paid by paper mills for pulpwood delivered to the mill has almost doubled. The increase has been absorbed before getting down to the tree farmer growing the wood. Low pulpwood stumpage prices discourage new forest investments and also result in poorer management of existing forests. With increasing land values, labor prices, and input costs, the average small landowner can't afford to grow trees.

The Southern Pine Bark Beetle forms a second problem. Presently this area is undergoing an epidemic of Southern Pine Beetles which results in direct losses of timber that cannot be salvaged and reduced prices for wood that is salvaged and utilized as a lower return product such as pulpwood instead of sawtimber. Many of these pure pine stands will revert to hardwood stands.

A third problem is cull hardwood competition. Due to the excellent forest fire prevention and control in the past, many older pine stands now have a cull hardwood understory. These older stands that are ready to harvest will be difficult to regenerate naturally and will require preparation and higher establishment costs. Also, the high cost of cull tree removal has brought about more competition between pines and cull hardwoods. It should be recognized, however, that although cull hardwoods have little merchantable value, they do provide high quality wildlife habitat in many areas.

There is the problem of continuing loss of forest land to spreading towns and cities, clearing for various types of rights of way and an increasing trend of city dwellers moving back to the country involving the clearing of homesites. This urbanization will increase as the population continues to increase.

Another problem in a portion of this WRPA is poor access to logging areas. Many of the "flatwood" sites in Union and Ouachita Parishes along the Ouachita River have been converted to pine sites. These areas can only be logged in late summer when dry. There are similar sites in the D'Arbonne bottom and other major creek bottoms. This problem is reflected in the timber size and types found in different areas. In the low areas, the timber is undercut and in the high areas the timber is overcut in the winter. Poor logging conditions run hand in hand with poor Southern Pine Beetle salvage which has already been mentioned.

All of the above problems contribute to landowner apathy, which brings us to the last problem which will be discussed. This is land clearing or conversion of forest land to farm land. In recent years the soybean market has climbed with no end in sight. This has resulted in a loss of large acreages of hardwood land. Also, in the past 2 years cattle prices have soared across the Nation. Although the full impact of this has not been felt yet, many upland forests will be lost to pasture. Some pine plantations upon reaching merchantability are being clear cut for pulpwood and the land put into improved pasture. This trend can be observed in Lincoln and Union Parishes, Louisiana.

Water

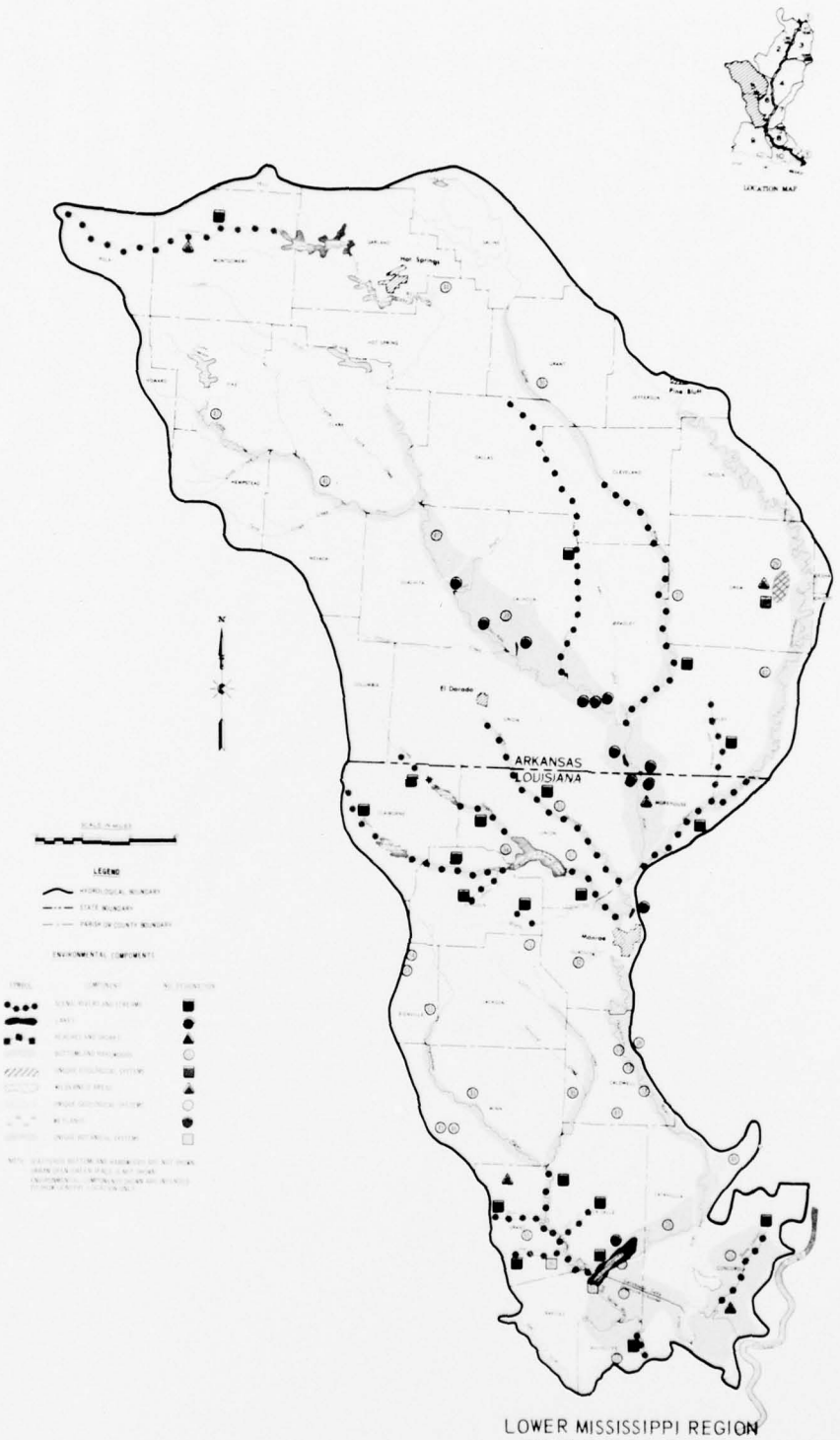
Development activities in WRPA 5 have increased silt loads and turbidity in the rivers and streams and have added to the natural degradation of these water bodies. Pesticides and herbicides from agricultural lands have the potential for making numerous lakes unsuitable for aquatic life, while waste discharges from municipal and industrial sources have degraded the quality of water in some streams, reducing their fishery potential and their suitability for some uses such as water contact recreation.

The most serious pollution is from oil field brines and associated wastes, which frequently cause fish kills. Aside from the brines, an oil line will occasionally break, spilling oil for several hours before discovery, and thus covering stream banks and water surfaces with unsightly crude oil. Too, there are occasional fish kills on the Ouachita River below sewer outfalls and discharge points for paper mill effluents.

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 5 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resource users, there is a short-term (1980) need to solve major pollution problems and otherwise protect the environmental quality of more than 200 miles of scenic rivers and streams, 31,300 acres of scenic lakes, and about 2,100 miles of sparsely developed shoreline around the scenic lakes. There are also short-term needs to protect several unique geological, botanical, and ecological systems, and about 432,000 acres of bottomland hardwoods. In addition, there is a need to provide about 14,000 acres of open and green space in urban and built-up areas, and a need to solve problems associated with forest lands.

The locations of land and water areas needed for preservation of the natural environmental quality of WRPA 5 are shown on figure 7, while acreage needs are listed in table 6.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 5

FIGURE 7

TABLE 6. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 5

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Scenic Rivers & Streams[1]	Miles	(572)	(278)	(294)	Need per mile equals 48 acres of land and 12 acres of water.
(1)	Bayou Cocodrie	Miles	22	22	0	From Wild Cow Bayou to Little Cross Bayou (existing supply included in La. Natural & Scenic 200 ft. strip of each side of streams).
(2)	Saline River	Miles	100	0	100	U. S. Hwy 79 between Fordyce & Pine Bluff to Ouachita River.
(3)	Ouachita River	Miles	50	0	50	Origin to Lake Ouachita.
(4)	Moro Creek	Miles	70	0	70	From origin near Leola to Ouachita River.
(5)	Bayou Bartholomew	Miles	75	75	0	From Ark.-La. State line to Dead Bayou (existing supply included in La. Natural and Scenic Rivers Act 398).
(6)	Bayou D'Loutre	Miles	55	45	10	From origin near El Dorado to Ouachita (existing supply, Ark.-La. State line to Ouachita R., included in La. Natural & Scenic Rivers Act 398).
(7)	Corney Bayou	Miles	30	26	4	From Ark. Hwy 15 SW to El Dorado to L. D'Arbonne (existing supply, Ark.-La. State line to Corney L. & Corney L. Dam to L. D'Arbonne, included in La. Natural & Scenic Rivers Act 398).
(8)	Bayou D'Arbonne	Miles	15	15	0	From Lake D'Arbonne to Ouachita R. (existing supply included in La. Natural & Scenic Rivers Act 398).
(9)	Middle Fork of Bayou D'Arbonne	Miles	27	27	0	From origin near La. Hwy 8 to Little R. (existing supply included in La. Natural & Scenic Rivers Act 398).
(10)	Trout Creek	Miles	10	10	0	From origin near La. Hwy 8 to Little R. (existing supply included in La. Natural & Scenic Rivers Act 398).
(11)	Little River	Miles	30	30	0	From junction of Dugdemona R. & Castor Cr. to Catahoula Lake (existing supply included in La. Natural & Scenic Rivers Act 398).
(12)	Big Creek	Miles	12	12	0	From U.S. Hwy 167 in Grant Parish to Little R. (existing supply included in La. Natural & Scenic Rivers Act 398).
(13)	Fish Creek	Miles	12	12	0	From origin near William to Little R. (existing supply included in La. Natural & Scenic Rivers Act 398).
(14)	Chemin-A-Haut Creek	Miles	35	0	35	From origin near Hamburg to Bayou Bartholomew.
(15)	Saline Bayou	Miles	4	4	0	From Saline Lake to Larto Lake.
(16)	Cypress Creek	Miles	15	0	15	From confluence with D'Arbonne upstream.
(17)	Choudrant Creek	Miles	10	0	10	From confluence with Bayou Choufrant upstream.
	Lakes[2]	Acres[3]	(35,241)	(32,945)	(2,296)	
(16)	Catahoula Lake	Acres	30,730	30,000	730	30 mi. of sparsely developed shoreline (acquire 730 ac. which is a 200 ft. strip along shore).
(17)	Grand Marais Lake	Acres	1,400	1,300	100	4 mi. of sparsely developed shoreline (acquire 100 ac. which is a 200 ft. strip along shore).
(18)	Fish Lake	Acres	65	0	65	1 mi. of sparsely developed shoreline (acquire 25 ac. which is a 200 ft. strip along shore).
(19)	Mossy Lake	Acres	350	0	350	2 mi. of sparsely developed shoreline (acquire 50 ac. which is a 200 ft. strip along shore).
(20)	Pereogeethe Lake	Acres	100	0	100	2 mi. of sparsely developed shoreline (acquire 50 ac. which is a 200 ft. strip along shore).
(21)	Eagle Lake	Acres	69	0	69	1 mi. of sparsely developed shoreline (acquire 25 ac. which is a 200 ft. strip along shore).
(22)	Benjamin Lake	Acres	65	0	65	1 mi. of sparsely developed shoreline (acquire 25 ac. which is a 200 ft. strip along shore).
(23)	Mutin Lake	Acres	77	0	77	1 mi. of sparsely developed shoreline (acquire 25 ac. which is a 200 ft. strip along shore).
(24)	Champagnolle Lake	Acres	400	0	400	2 mi. of sparsely developed shoreline (acquire 50 ac. which is a 200 ft. strip along shore).

TABLE 6. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 5 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Lakes (Cont.)					
(25)	Little Bay Lake	Acres	100	0	100	2 mi. of sparsely developed shoreline (acquire 50 ac. which is a 200 ft. strip along shore).
(66)	Black Bayou Lake	Acres	1,885	1,645	240	10 mi. of sparsely developed shoreline (acquire 240 ac. which is a 200 ft. strip along shore).
	Bottomland Hardwoods	Acres	(2,362,500)	(1,930,200)	(432,000)	
(26)	Dismal Swamp - Bayou Cocodrie Area	Acres	200,000	163,400	36,600	Gross need est. as 100% of total area of 200,000 ac. in forest measured from 1:250,000 scale map dated 1960.
(27)	Larto Lake-Catahoula Lake Area	Acres	220,000	179,000	41,000	Gross need est. as 100% of total area of 220,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(28)	Little River Lowlands	Acres	104,000	85,000	19,000	Gross need est. as 80% of total area of 130,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(29)	Seven Devils Swamp	Acres	20,500	15,500	5,000	Gross need est. as 100% of total area of 20,500 ac. in forest measured from 1:250,000 scale map dated 1961.
(30)	Felsenthal Basin	Acres	200,000	163,400	36,600	Gross need est. as 100% of total area of 200,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(31)	Bayou De Loutre Lowlands	Acres	4,800	3,900	900	Gross need est. as 80% of total area of 6,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(32)	Chenier Brake	Acres	3,600	2,900	700	Gross need est. as 80% of total area of 4,500 ac. in forest measured from 1:250,000 scale map dated 1961.
(33)	Dugdemona R. Lowlands	Acres	65,600	53,600	12,000	Gross need est. as 80% of total area of 82,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(34)	Bayou D'Arbonne Lowlands	Acres	106,400	86,900	19,500	Gross need est. as 80% of total area of 133,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(35)	Castor Creek Lowlands	Acres	64,000	52,300	11,700	Gross need est. as 80% of total area of 80,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(36)	Saline River Lowlands	Acres	115,200	94,100	21,100	Gross need est. as 80% of total area of 144,000 ac. in forest measured from 1:250,000 scale map dated 1961.
(37)	Saline River Lowlands	Acres	123,200	100,700	22,500	Gross need est. as 80% of total area of 154,000 ac. in forest measured from 1:250,000 scale map dated 1960.
(38)	Ouachita River Lowlands	Acres	131,200	107,200	24,000	Gross need est. as 80% of total area of 164,000 ac. in forest measured from 1:250,000 scale map dated 1960.
(39)	Ouachita River Lowlands	Acres	168,000	137,300	30,700	Gross need est. as 80% of total area of 210,000 ac. in forest measured from 1:250,000 scale map dated 1960.
(40)	Ouachita River Lowlands	Acres	96,000	78,400	17,600	Gross need est. as 80% of total area of 120,000 ac. in forest measured from 1:250,000 scale map dated 1960.
(41)	Little Missouri River Lowlands	Acres	77,000	62,900	14,100	Gross need est. as 70% of total area of 110,000 ac. in forest measured from 1:250,000 scale map dated 1960.
(42)	Bayou Bartholomew Lowlands	Acres	273,000	223,000	50,000	Gross need est. as 70% of total area of 390,000 forest measured from 1:250,000 scale map dated 1959.
	Other (scattered)	Acres	390,000	320,700	69,300	
	Unique Geologic Systems [4/]	Acres	(21,560)	(0)	(21,560)	
(43)	Diamond Mine (Pike County, Ark.)	Acres	500	0	500	
(44)	Magnet Cove Crater	Acres	7,000	0	7,000	
(45)	Caney Salt Mine	Acres	300	0	300	Near Winnfield, La. - salt dome.
(46)	Winnfield Marble Rock Quarry	Acres	300	0	300	Limestone outcropping chimney rock in quarry - quarry worked before Civil War.
(47)	Masley's Bluff	Acres	1,600	0	1,600	Along Bayou D'Arbonne in Union Parish - 300 ft. strip, 45 mi. long (22.5 mi. of stream).
(48)	Sicily Island	Acres	10,000	0	10,000	Catahoula Parish - geological formation - core of island, sandstone outcropping.
(49)	Chalk Deposit	Acres	100	0	100	Below Columbia, La.
(50)	Salt Springs	Acres	100	0	100	Catahoula Lake.

TABLE 6. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 5 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Unique Geologic Systems (Cont.)					
51	Bunker Hill-Grandview Bluff	Acres	290	0	290	Scenic Outlook - 4 mi. above Danville, Bienville Parish.
52	Rock Outcropping	Acres	50	0	50	Ouachita River.
53	Jordan Mountain	Acres	500	0	500	Bienville Parish on border of region - 460 ft.
54	Driscoll Mountain	Acres	500	0	500	Bienville Parish on border of region - 535 ft. highest point in La.
55	Waterfall	Acres	20	0	20	Grant Parish
58	Monelo Gap	Acres	100	0	100	Avoyelles Parish on Red River.
69	Bluff Banks	Acres	100	0	100	Caldwell Parish on Ouachita River.
70	Bluff Banks	Acres	100	0	100	Caldwell Parish on Ouachita River.
	Unique Botanical Systems	Acres	(80)	(0)	(80)	Included in bottomland hardwoods category.
56	Upland Hills	Acres	50	0	50	Unusual plant communities - Lasalle & Grant Parishes.
57	Catahoula Lake	Acres	30	0	30	Unusual cypress root formation.
	Open and Green Space	Acres	(13,000)	(0)	(13,000)	
	Wilderness Areas	Acres	(25,000)	(0)	(25,000)	
48	Felsenthal Basin	Acres	5,000	0	5,000	Included in bottomland hardwoods category.
59	Dismal Swamp	Acres	5,000	0	5,000	Included in bottomland hardwoods category.
60	Seven Devils Swamp	Acres	5,000	0	5,000	Included in bottomland hardwoods category.
61	Ouachita Nat'l Forest	Acres	5,000	0	5,000	Forests other than bottomland hardwoods.
62	Kisatchie Nat'l Forest	Acres	5,000	0	5,000	Forests other than bottomland hardwoods.
	Wetlands (included in Bottomland Hardwoods)					
	Unique Ecological Systems		(51,250)	(45,500)	(5,750)	
63	Catahoula Lake	Acres	30,730	30,000	730	Included in lakes category.
64	Seven Devils Swamp	Acres	20,500	15,500	5,000	Included in bottomland hardwoods category.
71	Natural Spring	Acres	20	0	20	Northeast corner of Jackson Parish.
	Total Land, All Components	Acres	(2,405,500)	(1,930,200)	(475,300)	
	Forests					
	Bottomland Hardwoods		2,362,500	1,930,200	432,300	
	Other Forests		30,000	0	30,000	
	Pasture		0	0	0	
	Urban		13,000	0	13,000	
	Other		0	0	0	
	Total Water, All Components	Acres	(40,460)	(36,140)	(4,320)	
	Large Water		33,870	32,940	930	
	Small Water		6,590	3,200	3,390	

1/ 48 acres of land per mile (200-ft. strip along each bank) included in bottomland hardwoods category.
2/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.
3/ Includes water surface and/or land along shore.
4/ 1,560 acres included in bottomland hardwoods category; 20,000 acres classified as other forests.

W R P A 6

ENVIRONMENTAL SETTING

General

WRPA 6 is the Lower Mississippi Region's smallest planning area. It covers only 3.5 million acres, or about 5.4 percent of the region, and it lies in northeastern Louisiana and southeastern Arkansas (figure 8). About 72,000 acres of the area are covered with water and the remaining 3.4 million acres are land areas.

The major drainage basins within this planning area are those of the Boeuf and the Tensas Rivers. The principal tributary of the Boeuf River is the Big Colewa Creek. That of the Tensas River is Bayou Macon. WRPA 6 lies entirely within the Alluvial Valley Physiographic Province.

Land Forms

The topography of WRPA 6 consists of fairly flat land with low natural terraces along the streambeds. The major surface relief in the area occurs along Macon Ridge, an area of rolling land about 10 miles in width, which extends in a straight line from Eudora, Arkansas, to Sicily Island, Louisiana, a distance of approximately 100 miles. Macon Ridge is considerably lower than Crowley's Ridge in WRPA 2, but it is similar. Both have well-defined, steep eastern bluffs with gentle and poorly defined western slopes. Macon Ridge rises 20 to 40 feet above the flood plain and separates the lowlands of the Mississippi River from the lowlands of the Boeuf and Ouachita Rivers. Crowley's Ridge and Macon Ridge are the highest divides between the major tributary streams of the entrenched valley system.

Except in the Macon Ridge area, relief in the alluvial area of WRPA 6 ranges from elevation 50 in the southernmost part to elevation 95 in the upper areas.

Land Use

Approximately 831,000 acres (24 percent) of WRPA 6 are forested; this represents 3 percent of the forest land in the Lower Mississippi Region.

Agricultural land in cropland and pasture accounts for 73 percent of the land in the planning area. Approximately 1.9 million acres are classified as cropland and 612,000 acres are classified as pastureland.

Urban and built-up areas account for 2 percent of WRPA 6, and the remaining 1 percent is in other miscellaneous uses.

Water Bodies

Rivers and Streams

The major rivers in WRPA 6 are the Boeuf and Tensas Rivers, both of which are free-flowing streams throughout their entire length. The Boeuf River rises in southeastern Arkansas and flows in a southwesterly direction about 230 miles to its confluence with the Ouachita River. The Tensas River is formed in northeastern Louisiana and flows southerly about 165 miles to its confluence with the Black River. Neither of these rivers nor their tributaries are used for commercial navigation, and no channel modifications have been made for that purpose. Both are used to varying degrees for recreation, water supply, and fish and wildlife purposes.

Natural Lakes

The largest natural lake in WRPA 6 is Lake Chicot, a 5,300-acre oxbow of the Mississippi River. This lake provides area residents with water-oriented recreation and it receives high fishing and waterfowl use. Other natural lakes in WRPA 6 include Lake Bruin, 2,342 acres; Lake Providence, 1,280 acres; and Lake St. Joseph, 1,197 acres. All of these are used extensively for recreation and fish and wildlife purposes. The facilities of Lakes Concordia and St. John, and those of Albemarle, Gassoway, and Yucatan Lakes, all physically located in WRPA 1, are shared in WRPA 6.

Man-made Impoundments

Other than numerous small farm ponds for livestock water or recreation (fishing), there are no significant man-made impoundments in this WRPA.

Some reaches of the Tensas River remain undisturbed, and provide high quality outdoor recreation opportunities

Shown here is the point where Connerly Bayou empties into Lake Chicot, the largest natural lake in WRPA 6

HISTORICAL BACKGROUND

Land Resources

From pioneer days to the postwar period of the late 1940's, the development and use of the native natural resources and raw materials in WRPA 6 has generally paralleled that in WRPA 5. However, the historic preponderance of the forestry industry in WRPA 5 has not been repeated in WRPA 6.

This planning area, with the exception of Macon Ridge, consists almost entirely of the Alluvial Valley of the Mississippi River, and its bottomland soils have long carried the bulk of Louisiana commercial agriculture. The bottomland soils are deep, flat lying, and of such favorable composition and structure for crop production that land use has been and is now devoted almost exclusively to farming and allied occupations. Forestry, in economic terms, follows agriculture as the second most important use of land. In terms of environmental quality, it is equally or more important, as probably recognized during the reforestation era of the past two decades.

One of the major advancements in forest management in Louisiana was the establishment of forest fire protection beginning in 1952. With protection, an interest developed in managing hardwoods. Leading the way were the larger forest industries. Interest in hardwood seedlings for forest planting influenced the State to grow hardwood seedlings for forest landowners. Though hardwood forest management is many years behind pine management, it is on the way, helped by special research.

A significant land use change in WRPA 6 has been the clearing of bottomland hardwoods for soybean planting. This started in the 1960's and is still underway. Since 1962 almost a million acres of Louisiana's forest land have been cleared and planted to soybeans.

This change from forest land to agriculture is not new to the area. The same thing happened in the early 1800's. The forests that existed before 1800 were cut and the land converted to agriculture, primarily cotton. That lasted until the Civil War. When slavery was abolished and no labor was available, the land reverted to timber. The land grows some of the best hardwoods faster than any other area of the region.

The cycle from timber to agriculture to timber and back to agriculture has repeated itself twice already. With the pressures for economic return, indications are the land may stay in agriculture this time.

None of the large tall timber (virgin timber) is left in this particular planning area. Some managed tracts and undisturbed tracts

along the Mississippi River and elsewhere have some high quality timber as big as 35-45 inches in diameter. The majority of the wooded area contains timber of small size generally 10 to 30 inches in diameter. Until recently, hardwood planting has not been practiced, but along the rivers much of the 35 to 45 inch timber is being cleared and hardwood plantations (mostly sycamore, sweetgum, and cottonwood) for pulpwood production are replacing them.

Water Resources

Early in the history of the region, water bodies in WRPA 6 were used as modes of transportation, water supply, food sources, recreation, and irrigation. Presently, the major uses are for recreation and irrigation, with minor uses by industry. Major navigation is not present, and hardly any of the surface water supplies have been developed or used for municipal water supplies.

Before 1960 there had been relatively little alteration of the natural conditions of the area's rivers and streams, except for those occasioned by natural and man-made pollution and by local drainage and irrigation projects. Since then, channel alterations in the interest of flood control have been completed by State and Federal agencies on more than 2,900 miles of streams, and more than 650 miles of additional alterations have been planned.

The extent to which the completed water resource projects may have affected the quality of the natural environment has generally not been subjected to close examination, nor can such effects be quantified here. The potential projects, however, must be scrutinized from this standpoint and any adverse effects taken into account.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in this appendix, the significant environmental quality components of WRPA 6 are limited to a few natural lakes, scattered stands of bottomland hardwoods with associated wetlands, and the remnants of a unique botanical system at Dutch Gardens. There are no significant open and green spaces in urban areas, no scenic rivers or streams, and no wilderness areas. Likewise, there are no unique geological or ecological systems. The only beaches and shores in the area are those associated with the natural lakes.

Lakes

In this relatively small planning area, there are only a few natural lakes whose scenic setting and sparsely developed shorelines are of such special value that they merit being maintained in their existing state as an inheritance for future generations. The largest of these is Lake Chicot, which covers approximately 5,300 acres. The others include Grand Lake, 1,400 acres; Belcoe Lake, 240 acres; Silver Lake, 200 acres; Lake Providence, 1,280 acres; and Woolen Lake, 220 acres. Portions of the shorelines of Lake Providence, Grand Lake, and Lake Chicot have been intensively developed, but significant stretches around these lakes remain fairly undisturbed.

Grand Lake, pictured above, is one of the many natural oxbow lakes in the region

Bottomland Hardwoods

The 756,000 acres of remaining bottomland hardwoods in WRPA 6 are scattered throughout the planning area in stands ranging in size from less than 4,000 acres to more than 100,000 acres. Collectively, they occupy a little over 2 out of every 10 acres of land within the area. Whether they are viewed as sources of commercial timber, havens for wildlife, unsightly breeding grounds for obnoxious vipers and mosquitos, areas of scenic splendor and scientific interest, or otherwise, depends upon the perception of the viewer. Regardless of the viewpoint, however, they are representative of a disappearing natural resource of national significance, and as such merit express consideration in plans and programs for the future use of the area's water and related land resources.

MAJOR ENVIRONMENTAL PROBLEMS

Land

Extensive land clearing for the production of soybeans in the past decade has eliminated much of the forest in WRPA 6 and proposed land clearing will claim many additional acres of forest in the future. This trend, carried too far, will serve to rob future generations of many intrinsic benefits to be derived from the yet remaining stands of bottomland hardwoods and their associated wetlands and ecological systems.

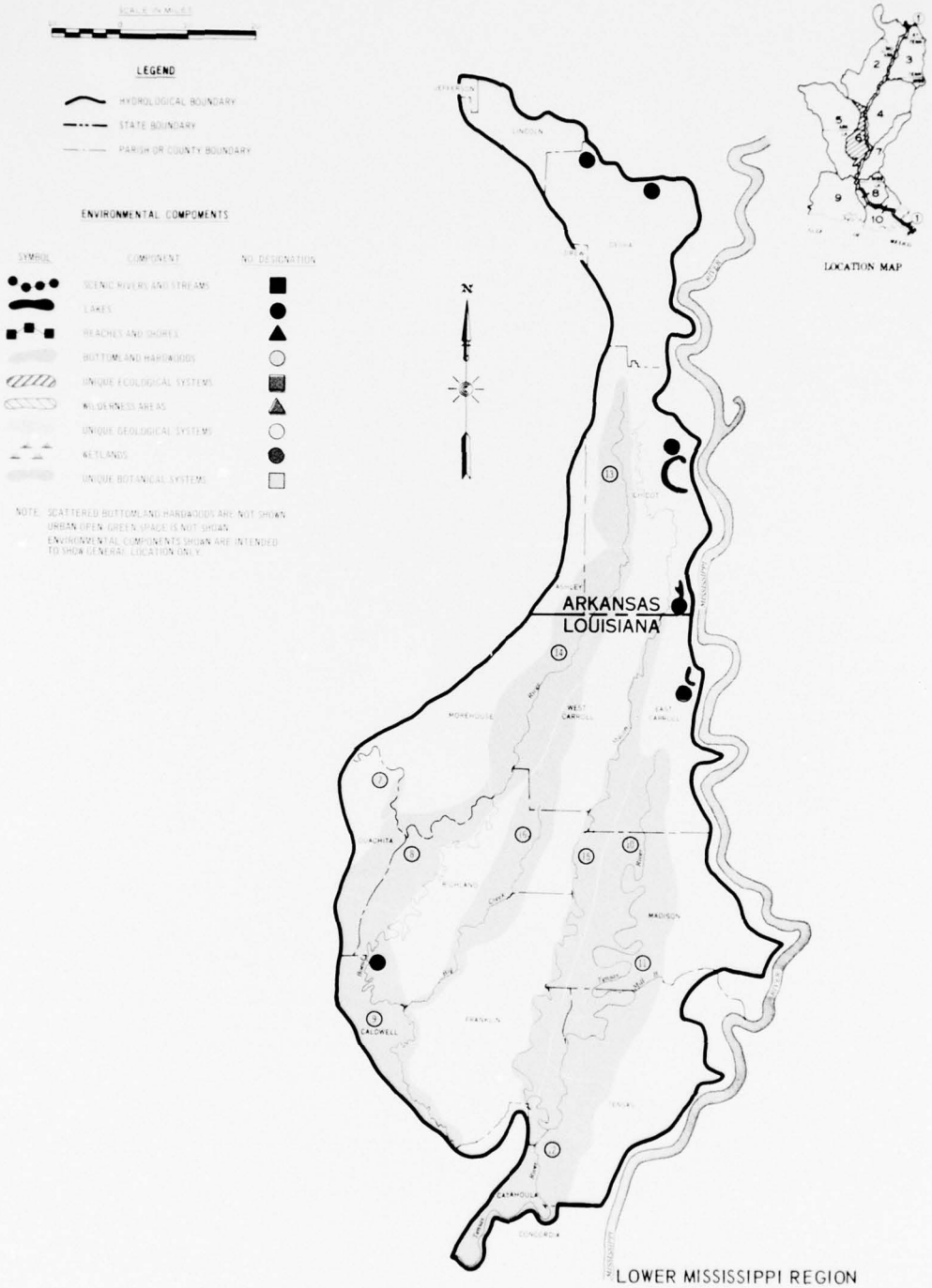
Only 24 percent of WRPA 6 remains forested, and land-clearing trends threaten the remaining woodlands

Water

Natural degradation occurs in all bodies of surface water. Such degradation is not known to be a major problem in WRPA 6, but it has been accelerated by the introduction of herbicides and suspended solids from agricultural runoff. This represents a threat to the environmental quality of the area through potential adverse effects upon the aesthetic appeal of the rivers, streams, and lakes, and their fishery resources.

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 6 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resource users, there is a short-term (1980) need to protect the water and sparsely developed shorelines of the scenically attractive lakes. There is also a need to protect approximately 147,000 acres of bottomland hardwoods. The locations of the land and water areas needed for preservation of the natural environmental quality of WRPA 6 are shown on figure 8. Needs expressed in terms of land and water acreages are listed in table 7.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 6

FIGURE 8

TABLE 7. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 6

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Lakes[1]	Acres[2]	(9,285)	(7,980)	(1,305)	
(1)	Grand Lake	Acres	1,600	1,400	200	8 mi. of sparsely developed shoreline (acquire 200 ac. which is a 200-ft strip along shore).
(2)	Belcoe Lake	Acres	385	0	385	6 mi. of sparsely developed shoreline (acquire 145 ac. which is a 200-ft strip along shore).
(3)	Lake Chicot	Acres	5,350	5,300	50	2 mi. of sparsely developed shoreline (acquire 50 ac. which is a 200-ft strip along shore).
(4)	Silver Lake	Acres	300	0	300	4 mi. of sparsely developed shoreline (acquire 100 ac. which is a 200-ft strip along shore).
(5)	Lake Providence	Acres	1,330	1,280	50	2 mi. of sparsely developed shoreline (acquire 50 ac. which is a 200-ft strip along shore).
(6)	Woolen Lake	Acres	320	0	320	4 mi. of sparsely developed shoreline (acquire 100 ac. which is a 200-ft strip along shore).
	Bottomland Hardwoods	Acres	(756,000)	(609,000)	(147,000)	
(7)	Wham Brake		3,400	2,700	700	Gross need est. as 100% of total area of 3,400 ac. in forest measured from 1:250,000 scale map dated 1960.
(8)	Bayou Lafourche Lowlands	Acres	45,000	36,300	8,700	Gross need est. as 100% of total area of 45,000 ac. in forest measured from 1:250,000 scale map dated 1960.
(9)	Bayou Lafourche Lowlands	Acres	71,300	57,400	13,900	Gross need est. as 100% of total area of 71,300 ac. in forest measured from 1:250,000 scale map dated 1960.
(10)	Tensas River Lowlands	Acres	48,000	38,700	9,300	Gross need est. as 90% of total area of 53,300 ac. in forest measured from 1:250,000 scale map dated 1960.
(11)	Tensas River Lowlands	Acres	101,300	81,600	19,700	Gross need est. as 90% of total area of 112,600 ac. in forest measured from 1:250,000 scale map dated 1960.
(12)	Tensas River Lowlands	Acres	93,800	75,600	18,200	Gross need est. as 100% of total area of 93,300 ac. in forest measured from 1:250,000 scale map dated 1960.
(13)	Big Bayou Lowlands	Acres	23,300	18,800	4,500	Gross need est. as 100% of total area of 23,300 ac. in forest measured from 1:250,000 scale map dated 1960.
(14)	Boeuf River Lowlands	Acres	92,300	74,400	17,900	Gross need est. as 100% of total area of 92,300 ac. in forest measured from 1:250,000 scale map dated 1960.
(15)	Bayou Macon Lowlands	Acres	41,500	33,400	8,100	Gross need est. as 90% of total area of 46,100 ac. in forest measured from 1:250,000 scale map dated 1960.
(16)	Big-Colewa Creek Lowlands	Acres	41,400	33,400	8,000	
	Other (scattered)	Acres	194,700	156,700	38,000	
	Open-Green Space	Acres	2,500	500	2,000	Land required in urban areas.
	Wetlands (included in Bottomland Hardwoods					
	Total Land, All Components	Acres	(758,500)	(609,500)	(149,000)	
	Forests					
	Bottomland Hardwoods		756,000	609,000	147,000	
	Other Forests		0	0	0	
	Pasture		0	0	0	
	Urban		2,500	500	2,000	
	Other		0	0	0	
	Total Water, All Components	Acres	(8,640)	(7,980)	(660)	
	Large Water		8,640	7,980	660	
	Small Water		0	0	0	

1/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.
2/ Includes water surface and/or land area along shore.

W R P A 7

ENVIRONMENTAL SETTING

General

WRPA 7, consisting of the Big Black River Basin and basins of southwest Mississippi streams that drain into the Mississippi River, is located in central and southwest Mississippi on the eastern side of the Lower Mississippi River region. The 6,574 square miles or 4.2 million acres of WRPA 7 are located entirely within the State of Mississippi and account for almost 7 percent of the total area in the Lower Mississippi Region.

Land Forms

The topography of the area ranges from flat unleveed Southern Mississippi Valley alluvium to the steep bluff hills of the Southern Mississippi Valley silty uplands. However, most of the area is fairly uniform and is made up of rolling hills and valleys. WRPA 7 is characterized by belted layers of geologic deposits which range from rolling to hilly land. Land surface elevations vary from about elevation 60 at the confluence of the Big Black and Mississippi Rivers to above elevation 500 along the eastern edge of the basin. The highest and most rugged terrain in WRPA 7 is found in the upper reaches of the eastern tributaries of the Big Black River Basin.

Land Use

Approximately 2.5 million acres (68 percent) of WRPA 7 are forested; this represents 9 percent of the forest land in the Lower Mississippi Region.

Agricultural land in cropland and pasture accounts for 25 percent of the land in the planning area. Approximately 337,000 acres are classified as cropland and 1.1 million acres are classified as pastureland.

Urban and built-up areas account for 3 percent of WRPA 7, and the remaining 4 percent is in other miscellaneous uses.

Water Bodies

Rivers and Streams

The principal stream in WRPA 7 is the Big Black River. The main channel of the river ranges in width from 90 feet in the headwater areas above Kilmichael, Mississippi, to over 250 feet in the Mississippi River backwater areas around Bovina, Mississippi. The Big Black rises in north-central Mississippi and flows southwesterly 270 miles to its confluence with the Mississippi River approximately 27 miles below Vicksburg, Mississippi. The terrain and configuration of the Big Black River Basin are such that no appreciable amount of the total drainage area is controlled by any single tributary. Numerous small tributaries enter the main channel at fairly even intervals throughout its length. These tributaries, few of which are over 20 miles in length, have their source in the hill areas and carry rapid runoff from their individual drainage areas. Most of the tributaries located in the upper half of the Big Black Basin are perennial, whereas streams in the lower half of the basin are intermittent. During dry periods, two-thirds of the flow in the main stem originates from the numerous perennial streams in the upper reaches.

Another major stream in WRPA 7 is the Homochitto River, which contributes a mean annual flow of approximately 1,500 c.f.s. or about 19 percent of the total mean flow for the WRPA. The Homochitto River rises near Brookhaven, Mississippi, and flows in a southwesterly direction approximately 80 miles to enter the Mississippi River about 22 miles below Natchez, Mississippi.

Other major streams in WRPA 7 are the Buffalo River, St. Catherine Creek, Coles Creek, and Bayou Pierre. Lengths of the Buffalo River and Bayou Pierre are 62 miles and 82 miles, respectively.

There are 450 miles of streams in WRPA 7 which are capable of supporting a fishery resource.

Man-Made Canals

There are no major man-made canals in WRPA 7, although approximately 95 miles of channel work have been completed in recent years, primarily by the Soil Conservation Service.

Natural Lakes

Lake Mary and Lake Rodney, both in the alluvial plain of the Mississippi River, are large oxbows of 5,000 acres and 1,550 acres, respectively. Smaller, but also significant, are Lake Karnac, 500 acres, and Foster Lake, 700 acres. Approximately 94,000 acres of small lakes are located throughout the alluvial plain and uplands of WRPA 7.

Man-Made Impoundments

There are no reservoirs in WRPA 7 which have a total capacity of 5,000 acre-feet or more; however, the Soil Conservation Service to date

The Big Black River has maintained essentially its natural state, although proposals have been made in recent years to modify the river to provide flood control, navigation, and other benefits

Some reaches of Big Bayou Pierre are outstandingly attractive, while others, because of silt or clay soil formations bordering the stream, tend to be very muddy during rainy periods

has constructed 21 flood detention structures in the Big Black Basin. The total detention storage for these structures is about 8,800 acre-feet.

Water Use

In the late 1800's some clearing and snagging were done on the Big Black River to facilitate navigation. In 1939 the Corps of Engineers completed navigation improvements consisting of 300 miles of clearing and snagging and 14 bendway cutoffs. In 1941 the Corps completed clearing and snagging operations in 14 upstream tributaries of the Big Black River. In recent years, however, there has been little interest in water transportation on the Big Black.

In 1936 channel work was authorized for the Buffalo River, but none has been initiated due to lack of local interest.

In 1899 navigation was authorized on the Homochitto River and, over the intervening years, clearing and snagging on 34 miles of the lower river have been completed. Also, 6 miles of bendway cutoffs have been completed, but little or no waterborne commerce has developed.

HISTORICAL BACKGROUND

General

Documentation of the history of man's impact upon the natural environment of WRPA 7 is sorely lacking in the available literature. Moreover, even though the streams of WRPA 7 drain directly into the Lower Mississippi River, their watersheds have been generally ignored in the past investigations of the region, as emphasis has been placed upon development in the alluvial portion of the lower valley rather than the uplands. Hence, the brevity and general nature of the synopsis that follows should be viewed not as a measure of the significance of past development activities in WRPA 7, but rather as an indication of needed research into the history of the planning area.

Land Resources

Before colonization, WRPA 7 was the domain of the Choctaw and Natchez Indian nations primarily, although smaller tribes were scattered throughout the area. The Indians derived their subsistence from hunting and fishing more so than from agriculture, although the Natchez are known to have grown food crops on a limited basis.

As explorers and colonists began to establish outposts in WRPA 7, the first of which was Fort Rosalie, built by the French at Natchez, Mississippi, in 1716, agricultural interest increased and production of tobacco and corn spread gradually inland from the Mississippi River. Cotton was grown in the Old Natchez District as a garden curiosity as early as 1722, but it did not become a commercial crop until the mid-1790's.

Culminating a long feud with the Natchez Indians, the French suffered a serious defeat in 1736, after which English and Spanish influence rose in prominence in the area. Feuds between England and Spain over governing rights to the territory continued until the end of the Revolutionary War in 1783, when England lost all of West Florida. Shortly thereafter, Spain, in a weakened position in Europe, turned over the area to France, which had returned to power under Napoleon.

Subsequently, Napoleon, needing finances for his European military exploits, sold the vast Louisiana territory to the United States in 1803. However, it was not until 1810 that the last remaining Spaniards were routed from a strip of land south of the 31st parallel.

Signs of increasing stability were evident as settlers began to move to the Natchez district. However, the war with England in 1812 caused tremendous upheaval in the Natchez-New Orleans area, and it was

not until after the end of this conflict that the area entered into a period of sustained colonization and stable development.

Treaties were signed with the Choctaw, Chickasaw, and Creek tribes to establish overland passageways for emigrating settlers. The first trail was the Natchez Trace, in the Big Black basin.

With the creation of the State of Mississippi in 1817, additional treaties were signed with the Indians, opening vast areas of land in WRPA 7 for white settlement. Immigration to the area steadily increased during the 1800's, and although many agrarian pioneers began moving into adjoining WRPA 4 during this period, the Old Natchez District remained the most advanced, most intensively cultivated area in Mississippi until the Civil War.

At the turn of the century, extensive cultivation was evidenced in WRPA 7, primarily in the middle and upper reaches of the Big Black basin. Excluding the highly developed Old Natchez District, the slow growth and development of the interior portions of the planning area, coupled with prohibitive topographical limitations in the steep uplands, are fundamental reasons for the relatively unspoiled, unexploited nature of the southern half of WRPA 7 today.

Water Resources

Most of the early settlement in WRPA 7, as would be expected, was concentrated along the rivers and streams of the area. Expanded agricultural enterprises subsequently gave rise to interest in flood control, and in 1899 clearing and snagging operations were authorized on the lower 35 miles of the Homochitto River to increase floodwater carrying capacities. Also, in subsequent years, six bendway cutoffs were made to facilitate flood routing on the Homochitto. The most recent flood control work was authorized in 1936 and completed in 1952.

Although channel modifications were authorized on the Buffalo River in 1936, no work has been done on the stream because of lack of local interest and insufficient economic justification.

Limited clearing and snagging on the Big Black River were conducted in the late 1800's to facilitate navigation. In 1939, primarily in the interest of flood control, over 300 miles of the Big Black was cleared, snagged, and straightened by cutoffs. In 1941 similar channel modifications were completed in 14 upstream tributaries of the Big Black. No additional work has been conducted on the main stem of the Big Black due to insufficient economic justification. However, the Soil Conservation Service has completed channel modifications and constructed 12 floodwater detention structures on upstream tributaries of the Big Black.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in the appendix, there is no single outstanding environmental quality component in WRPA 7. Scenic streams and lakes and stands of bottomland hardwoods are scattered throughout the area, and several wilderness areas, unique geological systems and unique ecological systems have been identified. However, there are no known unique botanical systems and only insignificant amounts of open and green space associated with urban and built-up areas. Because of the inland setting of the WRPA, there are no significant beaches or shores, and wetlands are generally limited to those related to bottomland hardwood areas.

Scenic Rivers and Streams

The most significant stream in WRPA 7 is the Big Black River, which is relatively unexploited and has been subject to no major, continuing navigation, flood control, or related works. Although the Big Black is free-flowing and unregulated, the quality of the water is poor, owing to very high sediment transport. Other streams possessing aesthetic attractions, although in some instances poor water quality, are the Homochitto River, Buffalo River, Big Bayou Pierre, Little Bayou Pierre, and Coles Creek.

Lakes

Within the hydrologic boundary of WRPA 7 there are at least four natural lakes whose scenic setting and sparsely developed shorelines are of such special value that they should be considered for being maintained in their existing state as an inheritance for future generations. The largest of these is Lake Mary, covering 5,270 acres. Next is Rodney Lake, covering 1,695 acres. Foster Lake and Lake Karnac encompass 820 and 550 acres, respectively.

Bottomland Hardwoods

The remaining major stands of bottomland hardwoods in WRPA 7 range in size from about 14,500 to 235,700 acres. Whether these hardwood forests are viewed as sources of commercial timber, havens for wildlife and waterfowl, unsightly breeding grounds for obnoxious vipers and mosquitos, areas of scenic splendor and scientific interest, or otherwise, depends upon the perception of the viewer. In any case, the bottomland hardwoods represent part of a disappearing natural resource of national significance, and as such they merit express consideration in plans and programs for the future use of the area's water and land resources.

The falls on Turkey Creek, a small tributary of Bayou Pierre, are the most attractive in WRPA 7

Lake Mary, a Mississippi River oxbow lake, is one of the many large natural lakes in the region

Unique Geological Systems

The most significant geological system in WRPA 7 is a 500-acre portion of the Loess Hills Bluffs, which extend for almost 90 miles in WRPA 7.

Unique Ecological Systems

The Buffalo River-Foster Lake Area, covering 3,000 acres, possesses unique ecological systems of intrinsic value which contribute to the general quality of life of the people living in and visiting WRPA 7.

Wilderness Areas

There are approximately 30,000 acres of wilderness area in WRPA 7. The area is divided equally among the Buffalo River-Foster Lake Area, Grand Gulf Area, and Homochitto National Forest. These areas offer aesthetic enjoyment and limited forms of recreation such as camping, picnicking, and hiking.

The vast tract of timber, partly in virgin state, in the Grand Gulf area of WRPA 7 is an excellent example of a near-wilderness environment

MAJOR ENVIRONMENTAL PROBLEMS

Land

Overall, the condition of the natural environment in WRPA 7 is fairly stable. The resource base has not been severely exploited or degraded in the past as is the case in many areas in adjoining WRPA 4, and the likelihood of calamitous adverse changes in the quality of the environment is remote. Scattered land clearing is evidenced throughout the planning area, but more so in the upper reaches of the Big Black River basin, where topography and soil fertility are very favorable for agricultural operations. In the steep hill country of WRPA 7, the timber resource remains well established and balanced. The diversity of land use patterns creates attractive scenery and, in many instances, outstanding areas of natural beauty in a rustic setting.

Soil erosion, both natural and man-caused, is and has been a rather serious problem in WRPA 7, particularly in the Big Black River basin. The high turbidity of the Big Black and its many short tributaries is attributable to extensive sheet and gully erosion.

Both the land and water resources of the middle and southern portions of WRPA 7 retain many of their "wild" characteristics, thus contributing much to the aesthetic appeal of the planning area.

Water

The overall quality of the water resources in WRPA 7 is good. However, pollution from municipal, industrial, and oil field waste disposal is a serious threat to water quality in scattered areas, particularly in the vicinity of Pickens and Canton, Mississippi. Also, sand and gravel mining operations pose a significant threat to water quality in the middle and lower portions of WRPA 7.

High sediment transport and resultant turbidity detract from the quality of the Big Black and its tributaries, although the streams in the lower portion of WRPA 7 are generally clear and attractive. A factor of considerable importance regarding sedimentation and turbidity is the variety of soil types traversed in a north-to-south direction in the planning area. Whereas the Big Black basin has muddy banks and bottom, the streams in southern WRPA 7 have rather firm, sandy banks and bottoms, thus greatly enhancing their appearance. Also, a substantial portion of the base flow in several streams of the lower portion of WRPA 7 is attributable to natural springs, thus further explaining the good water quality.

Stream channelization in WRPA 7 has produced adverse effects in several upstream areas of the Big Black River basin, but little channel

work has been performed in the lower reaches of the basin or in the independent watersheds in the southern portion of the planning area. However, extensive channelization proposed in watershed projects not yet initiated could have dramatic adverse effects upon both the land and water resources of WRPA 7.

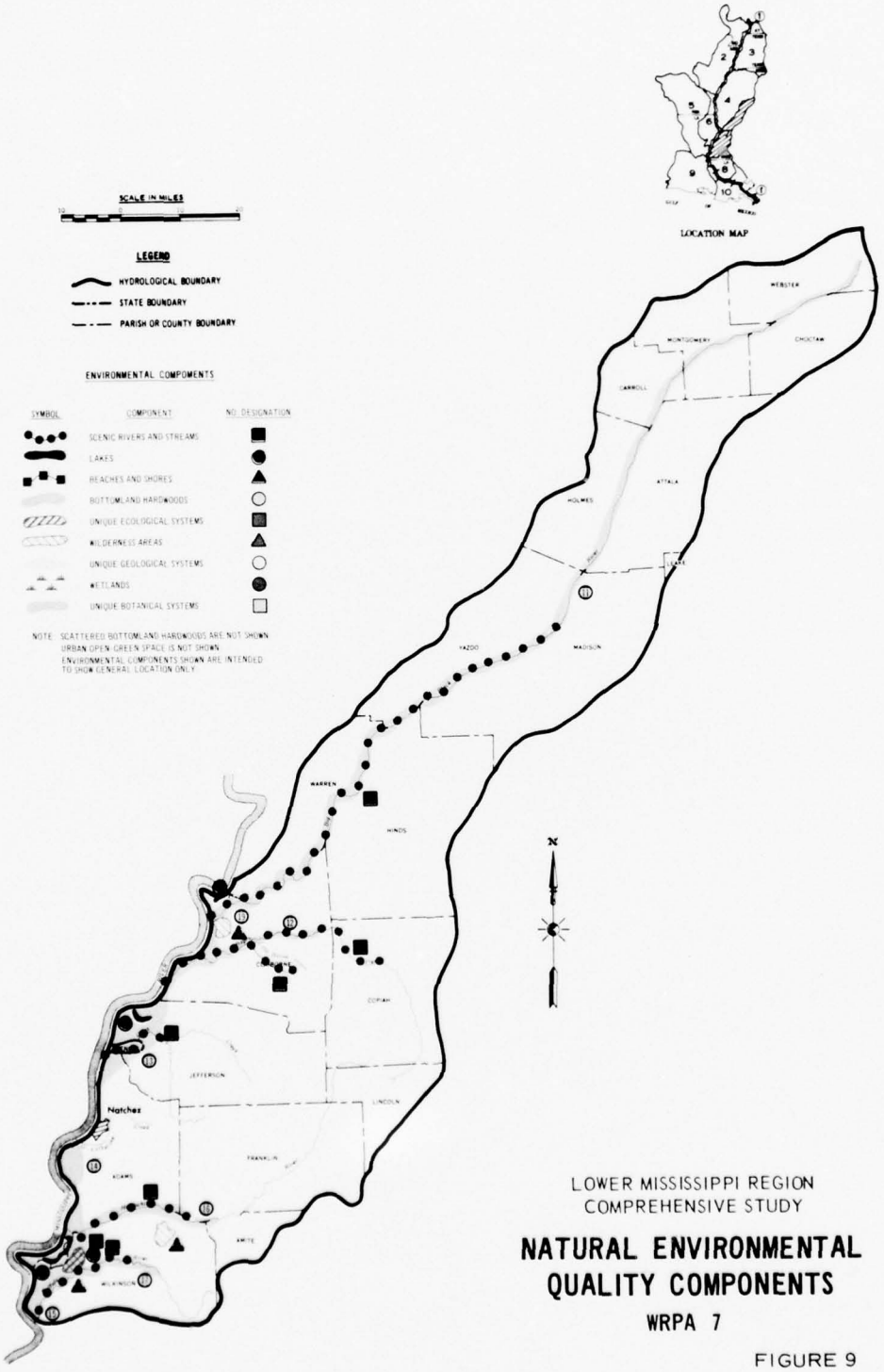
Pollution from oil field wastes, primarily salt brine flushed from well pits, has been serious in the past, but efforts by State pollution control authorities to control discharges into streams have been quite effective in curbing this problem.

Since WRPA 7 is a major oil-producing area, land and water pollution associated with petroleum production is a serious localized problem

Herbicides and pesticides pose potential pollution problems wherever they are used, and such problems are therefore present in the areas of WRPA 7 where row crops are grown on an expanded basis. In 1969, 47,265 tons of fertilizer were applied to 251,500 acres of land in WRPA 7, thus creating a significant source of nutrients for water bodies in the planning area. The many oxbow lakes in WRPA 7, located primarily in bottomland hardwood areas along the Big Black River, are in good condition, and the surrounding wetland environment of these lakes appears to be in no immediate danger of decline or destruction.

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 7 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resource users, there is a short-term (1980) need to protect 266 miles of free-flowing, unexploited rivers and streams in addition to approximately 124,085 acres of land and other water areas. The lands needed for environmental quality purposes include 92,500 acres of bottomland hardwoods, 500 acres of unique geologic systems, and 30,000 acres of wilderness area. Included in these land acreages are undeveloped shorelines of water bodies needed for environmental quality purposes. Such water bodies include four lakes covering almost 4,250 acres. The locations of land and water areas needed for preservation of the natural environmental quality of WRPA 7 are shown in figure 9. The acreage needs are summarized in table 8.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 7

FIGURE 9

TABLE 8. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 7

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Scenic Rivers and Streams[1]	Miles	(266)	(0)	(266)	Need per mile equals 48 acres of land and 12 acres of water.
1	Big Black River	Miles	130	0	130	From Bowie Creek near Miss. Hwy 16 to mouth.
2	Homochitto River	Miles	30	0	30	From Miss. Hwy. 33 at Rosetta to Lake Mary.
3	Big Bayou Pierre	Miles	50	0	50	From Foster Creek near Dentville to mouth.
4	Little Bayou Pierre	Miles	16	0	16	From vicinity NE of Barland to mouth.
5	Coles Creek	Miles	10	0	10	From Bluff line to mouth.
6	Buffalo River	Miles	30	0	30	From vicinity of U. S. Hwy. 61 bridge to mouth.
	Lakes[2]	Acres[3]	(8,335)	(7,250)	(1,085)	
7	Lake Karnac	Acres	550	0	550	2 miles of sparsely developed shoreline (acquire 550 acres which is a 200-ft strip along shore.
8	Rodney Lake	Acres	1,695	1,550	145	6 miles of sparsely developed shoreline (acquire 145 acres which is a 200 ft strip along shore.
9	Foster Lake	Acres	820	700	120	5 miles of sparsely developed shoreline (acquire 120 acres which is a 200-ft strip along shore).
10	Lake Mary	Acres	5,270	5,000	270	11 miles of sparsely developed shoreline (acquire 270 acres which is a 200-ft strip along shore).
	Bottomland Hardwoods	Acres	(499,800)	(407,300)	(92,500	
11	Big Black River Lowlands	Acres	235,700	192,100	43,600	Gross needs estimated as 90% of total area of 261,900 acres in forest measured from 1:250,000 scale map dated 1960.
12	Bayou Pierre Lowlands	Acres	29,100	23,700	5,400	Gross needs estimated as 90% of total area of 32,300 acres in forest measured from 1:250,000 scale map dated 1960.
13	Rodney Lake Area	Acres	29,100	23,700	5,400	Gross needs estimated as 100% of total area of 29,100 acres in forest measured from 1:250,000 scale map dated 1960.
14	St. Catherine's Creek Area	Acres	14,500	11,800	2,700	Gross needs estimated as 100% of total area of 14,500 acres in forest measured from 1:250,000 scale map dated 1960.
15	Lake Mary Area	Acres	77,600	63,200	14,400	Gross needs estimated as 100% of total area of 77,600 acres in forest measured from 1:250,000 scale map dated 1960.
16	Homochitto River Lowlands	Acres	45,400	37,000	8,400	Gross needs estimated as 90% of total area of 50,440 acres in forest measured from 1:250,000 scale map dated 1960.
17	Buffalo River Lowlands	Acres	17,500	14,300	3,200	Gross needs estimated as 90% of total area of 19,400 acres in forest measured from 1:250,000 scale map dated 1960.
	Others (Scattered)	Acres	50,900	41,500	9,400	
	Unique Ecological Systems[4]	Acres				
18	Buffalo River - Foster Lake Area	Acres	3,000	0	3,000	This area is included in Wilderness Area category.
	Unique Geological Systems[4]					
19	Loess Bluff Hills	Acres	500	0	500	Near Vicksburg, 300-ft strip 14 miles long.
	Wilderness Areas	Acres	(30,000)	0	(30,000)	
20	Buffalo River - Foster Lake Area	Acres	10,000	0	10,000	Not included in bottomland hardwoods
21	Grand Gulf Area[4]	Acres	10,000	0	10,000	
22	Homochitto National Forest[4]	Acres	10,000	0	10,000	
	Urban Open and Green Space	Acres	1,000	0	1,000	
	Wetlands (Included in Bottomland Hardwoods)					

TABLE 8. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 7 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Total Land, All Components	Acres	(510,800)	(407,300)	(103,500)	
	Forests					
	Bottomland Hardwoods		499,800	407,300	92,500	
	Other Forest		10,000	0	10,000	Buffalo River - Foster Lake area.
	Pasture		0	0	0	
	Urban		1,000	0	1,000	
	Other		0	0	0	
	Total Water, All Components	Acres	(10,810)	(7,250)	(3,560)	
	Large Water		7,750	7,250	500	
	Small Water		3,060	0	3,060	Surface area of scenic streams.

1/ 48 acres of land per mile (200-ft. strip along each bank) included in bottomland hardwoods category.
2/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.
3/ Includes water surface and/or land area along shore.
4/ Included in bottomland hardwoods category.

W R P A 8

ENVIRONMENTAL SETTING

General

WRPA 8, which consists of about 3.6 million acres or approximately 6 percent of the Lower Mississippi Region, lies in southeastern Louisiana and southwestern Mississippi. The Mississippi River divides WRPA 8 into two areas of approximately 4,912 square miles to the east and 793 square miles to the west. About 5,521 square miles of the area are land, and the remaining 184 square miles are covered with water.

That section of WRPA 8 lying east of the Mississippi River contains the four major drainage basins of the Amite, Tickfaw, Natalbany, and Tangipahoa Rivers. All of these drain into WRPA 10 through Lake Pontchartrain.

That portion of WRPA 8 west of the Mississippi River is bounded on the east and north by the west bank Mississippi River levee between Morganza, Louisiana, and White Castle, Louisiana. The western boundary is the east Atchafalaya basin protection levee. The southern boundary is a line between White Castle, Louisiana, and the east Atchafalaya basin protection levee at the latitude of approximately 30 degrees.

Most of WRPA 8 lies within the Alluvial Valley Physiographic Province, except for the northeastern corner which falls within the Southern Hills Physiographic Province.

Land Forms

The terrain east of the Mississippi River consists of rolling hill lands and alluvial lowlands with a fringe of tidal marsh at the shorelines of Lakes Maurepas and Pontchartrain. In the hill lands, elevations vary from 50 feet at the latitude of Baton Rouge to about 500 feet northwest of McComb, Mississippi. Here the landscape is largely covered by pine forests and the streams are confined in well-defined valleys. The alluvial lowlands are south of the hills and extend from the latitude of Baton Rouge to the shores of Lakes Pontchartrain and Maurepas. Within the lowlands, tidal marshes and swamps are located along the lakes' perimeters and adjacent to the streams.

Land Use

Approximately 2.3 million acres (64 percent) of WRPA 8 are forested; this represents 8 percent of the forest land in the Lower Mississippi Region.

Agricultural land in cropland and pasture accounts for 30 percent of the land in the planning area. Approximately 329,000 acres are classified as cropland and 709,000 acres are classified as pastureland.

Urban and built-up areas account for 3 percent of WRPA 8, and the remaining 1 percent is in other miscellaneous uses.

Water Bodies

Rivers and Streams

The major rivers in WRPA 8 are the Amite, Tickfaw, Natalbany, and Tangipahoa Rivers. There are no man-made impoundments on these rivers, but the natural channel of the Amite River has been modified to varying degrees in the interest of navigation.

The Amite River rises in southwestern Mississippi and flows in a south and southeasterly direction for a distance of 170 miles to Lake Maurepas. From its mouth there is a navigable connection through Lake Maurepas and Pass Manchac to Lake Pontchartrain and thence to New Orleans and the Gulf Intracoastal Waterway and other Mississippi River ports. The head of navigation on the Amite is at the mouth of Bayou Manchac (river mile 35.7). In the reach below mile 35.7, the channel of the Amite meanders through a heavily timbered swamp with little relief. Between Bayou Manchac and the mouth of Comite River (mile 54) the Amite meanders through a narrow timbered valley cut through low pine covered hills. From this juncture, the Amite has a steep bed slope to its source, and is a typical hill country stream. There was no commerce reported on this stream in 1970, but it is heavily used for recreation purposes.

The Tickfaw River rises in southwestern Mississippi and flows in a southerly direction to Lake Maurepas. The Natalbany River, from its source to mile 25, flows through low pine hills; the lower 25 miles of channel wind through heavily timbered swamps to Lake Maurepas. The Tangipahoa River originates in southwest Mississippi near the town of McComb and flows in a southerly direction for a distance of about 110 miles to its terminus in the northwest portion of Lake Pontchartrain. Streamflow is fairly rapid in the upper reaches but becomes tidal in the lowlands adjacent to the lake. These rivers are used for recreation and fish and wildlife purposes.

Although the lower portion of the Amite River has been developed for navigation, many of the upper reaches remain virtually in a natural state

Natural Lakes

The most important natural lake in WRPA 8 is Lake Maurepas. This water body covers 58,850 acres and is of high value to fish and waterfowl. In addition, it receives heavy recreation usage. The only other natural lake of any significance is the False River Lake, a 3,100-acre oxbow of the Mississippi River. This oxbow is heavily used by fishermen and it provides waterfowl habitat.

Man-made Impoundments

Except for numerous small farm ponds for livestock water or recreation (fishing), there are no significant man-made impoundments in this WRPA.

HISTORICAL BACKGROUND

Land Resources

In pioneer days the hills, terraces, and Mississippi River flood plain areas of WRPA 8 were almost completely covered by virgin forests. On the hills were pure pine stands and in the river bottoms there was pure cypress. So thick were the forests, it has been said a squirrel could travel from the Mississippi line to the Gulf of Mexico without getting in the sunlight. This may have been literally true in those days, but probably not for long.

As early as 1730 land was being cleared and cypress was made an export item despite the difficulties of swamp logging. The large trees growing in the swamp had to be cut from boats or rafts, floated or dragged through the swamp, and taken out to a sawmill to be cut into boards. Even so, the nearby Mississippi River offered a ready means of transportation to New Orleans markets, and the forests in WRPA 8 were among the first to be cut in the region.

The timber cutting continued throughout the 1700's and even into the late 1800's at a rather slow pace dictated by a budding lumber industry. Between 1870 and 1900, however, several things happened to accelerate the pace. The lumber industry, responsive to demands of northern markets for more wood, began migrating from depleted northern timber stands to the South. Railroad transportation was expanded, and new mechanical equipment, such as the overhead logging cableway steam skidder and railroad skidders, became available. These things in combination with available capital and labor made the time right for harvesting the mature and overmature virgin pine and virgin cypress in the WRPA.

By the time of the 20th Century, virgin timber cutting was well underway in southeast Louisiana. The peak was reached in 1913. This period when the lumber industry cut over Louisiana was called the "Golden Era" and it encompassed the days of the big sawmills. For example, in 1908 the largest sawmill in the world was built at Bogalusa, Louisiana. This one mill, owned by the Great Southern Lumber Company and utilizing virgin pine from southeast Louisiana and southern Mississippi, sawed an average of 1 million board feet of lumber each day.

The clearcutting of mature and overmature virgin timber drew to a close in the 1930's. The number of sawmills then dropped dramatically; mills shut down leaving behind ghost towns, unemployment, and desolation in the form of thousands of acres of cutover lands. After the cutout and get out period, much of the open range area owned by large forest industries and absentee owners was used for dairy farms and for running scrub range cattle.

Renewed demands for timber during World War II required cutting anything that was left over from the big sawmills. Many small portable mills sprang up to cut 2 x 4's and other small dimension lumber wherever timber could be found. This not only filled the war demands, it resulted in cutting millions of feet of cull timber which was made into useful products. As a by-product, it cleared from the land undesirable growth and trees that could never have been harvested economically under normal conditions.

The past quarter-century has been an era of reforestation, putting thousands of acres of previously cleared land back into trees. It has further been an era of expanding fire detection and suppression, beginning tree improvement through forest genetics, developing cull hardwood removal methods, combating hardwood competition in pine areas, beginning hardwood management, intensifying pine management, developing insect and disease control methods, and beginning large scale recreation plans. Industries have practiced intensive management of their forest lands to insure permanent supplies of timber, and legislation has been passed to make it economical for industries to grow trees. The Forest Taxation law of 1954, in particular, has been an asset to timber growing.

In 1970 the gross product originating from forestry in WRPA 8 amounted to approximately $21 million, or about one-third of the gross product originating from agriculture in that area. This ratio signifies the relative economic importance of the area's forestry and agriculture. The terraces of WRPA 8 have historically been used for agricultural production. Important crops today are cotton, soybeans, small grain, sweet potatoes, and strawberries.

Water Resources

In WRPA 8, as in other planning areas of the region, the rivers have a long history of navigation use and have been altered to varying degrees to better serve that purpose. The Tangipahoa River, for instance, was improved for navigation as early as 1884. The Federal project completed at that time consisted of the removal of overhanging trees, snags, and other navigation obstructions on the lower 53 miles of the river. That project has since been maintained and others have been constructed throughout the area.

At about the same time the Tangipahoa River was being cleared and snagged, the water hyacinth was introduced into the United States. This aquatic plant was introduced at the Cotton Exposition in New Orleans in 1884, and spread throughout southern Louisiana and Florida to such an extent that by 1898 the Congress was requested to intercede. The Congress authorized a Federal program to control this plant and operations to do so began in 1900.

From 1902 to 1937 the hyacinth was controlled entirely by treating with sodium arsenite. During the 35 years of control by sodium arsenite, operations were confined to about 300 miles of navigable waterways per year. Destruction by chemicals was abandoned in 1937 in favor of the quicker and more satisfactory method of destruction by mechanical means. Since the late 1940's, use of the plant hormone 2, 4-D gradually replaced mechanical destruction except in unusual cases. Because of the possible adverse effects of herbicides on the environment, efforts are constantly being made to improve the methods of plant control.

Over the years, the aquatic plant control efforts have been accomplished by the Federal construction and maintenance of other projects to improve navigation in the area. In 1912 snags and logs were removed from Pass Manchac and from entrance bars in Lake Maurepas and Lake Pontchartrain. Four years later a project consisting of dredging a navigation channel and removing snags and trees in the lower 29 miles of Bayou Grosse Tete was completed. That project was followed by similar clearing and snagging work which was completed in 1921 on the Tickfaw, Natalbany, Ponchatoula, and Blood Rivers and in 1928 improvements for navigation on the Amite River and Bayou Manchac were completed.

These waterway projects have fulfilled the navigation needs of the planning area for the past four decades, and no new projects for navigation in the area have been authorized during that time. However, several channel improvement projects have been constructed for flood control purposes. The first of these, completed by the Corps of Engineers in 1948, consisted of snagging and clearing on Bayou Francois and New River. Between 1948 and 1958, small clearing and snagging projects were also completed on Ponchatoula and Selser Creeks, and on the Yellow Water, Little Tangipahoa, Natalbany, and Tickfaw Rivers. During the 1960's, the Amite River and its tributaries were modified to varying degrees to improve their flood carrying capacity, and about 25 miles of channel improvements were completed in the Panama Canal-Conway Bayou Watershed. Both of these were federally constructed. The latest channel improvement works, involving almost 1,450 miles of channels, have been constructed by the State of Louisiana to provide flood control for approximately 3.3 million acres of land.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in this appendix there is no single outstanding environmental quality component in WRPA 8. Scenic rivers and streams and stands of bottomland hardwoods are scattered throughout the area, and several unique botanical and geological systems have been identified. In addition, there are two lakes with outstanding scenic qualities. However, there are no known unique ecological systems and only insignificant amounts of open and green space associated with urban and built-up areas. There are no significant beaches and shores, and wetlands are generally limited to those related to bottomland hardwood areas.

Scenic Rivers and Streams

Portions of the Amite, Comite, Tickfaw, Tangipahoa, and Blind Rivers and the lower 12 miles of Chappepeela Creek have been designated for protection in State legislation (Louisiana Natural and Scenic Rivers Act 398). In addition to these, all or portions of Bayous Sara and Manchac, Thompson Creek, East and West Forks of the Amite River, and the Natalbany River are scenically attractive and merit consideration for preservation in their existing condition.

The Tangipahoa River is one of the most outstanding streams in WRPA 8

Lakes

Within the hydrologic boundary of WRPA 8, there are only two lakes whose scenic setting and sparsely developed shorelines are of such special value that they should be considered for maintenance in their existing state as an inheritance for future generations. These are False River Lake and Lake Maurepas. The larger of these is Lake Maurepas, covering 58,850 acres. False River Lake covers almost 3,100 acres.

Bottomland Hardwoods

The remaining stands of bottomland hardwoods in WRPA 8 range in size from about 40,000 to 378,000 acres. Whether these hardwood forests are viewed as sources of commercial timber, havens for wildlife and waterfowl, unsightly breeding grounds for obnoxious vipers and mosquitos, areas of scenic splendor and scientific interest, or otherwise, depends upon the perception of the viewer. In any case, the bottomland hardwoods represent part of a vanishing natural resource of national significance, and as such they merit express consideration in plans and programs for the future use of the area's water and related land resources.

Unique Geological Systems

In terms of area covered, the most significant geological system in WRPA 8 is the Tunica Hills which occupy 200,000 acres. Other systems are much smaller, ranging in size from 50 to 500 acres.

Unique Botanical Systems

Significant botanical systems in WRPA 8 consist of Zemurray Gardens, Port Hudson, Louisiana; stand of pines at Chipola, Louisiana; virgin stands of cypress at Clio, Louisiana; spruce pine stands in Livingston and Tangipahoa Parishes, Louisiana; and a loblolly pine stand with typical pine climax understory (St. Helena Parish, Louisiana). These systems range in size from 50 to 1,000 acres.

MAJOR ENVIRONMENTAL PROBLEMS

Land

Problems related to forest lands in WRPA 8 include fire, insects, cull hardwoods, landowner apathy, low pulpwood prices, logging problems, and solid waste disposal on forest lands.

WRPA 8 has over 11,000 acres burned per year by approximately 1,600 wildfires, of which 95 percent are arson fires and the majority of the others are man-caused. These fires pose a threat not only to the valuable timber resource, but also to lives, personal property, and wildlife.

The insect problem in WRPA 8 is sporadic. In the mid-1960's East Feliciana Parish had a major epidemic of Southern Pine Beetles. Since that time the population of beetles in the area had remained in balance until the spring of 1972 when again epidemic proportions were reached. Ips Beetles are also found in certain areas and have infested several large areas. Forest Tent Caterpillars are generally a problem in the spring in the Livingston Parish swamp but have needed no control. Southern Pine Beetles and Ips Beetles are the only insect problems in the WRPA at present.

Cull hardwoods, both in pure stands and mixed with pines, are found throughout WRPA 8. This problem includes poor species for lumber and wildlife uses and poor form class among the desirable species. Also, many times prime hardwood land is cleared and regenerated with pine rather than being replanted with desirable hardwoods.

Landowner apathy is widespread in WRPA 8. Many small landowners lack a thorough understanding of the value of their forest and of other forest land to themselves and to their environment. The average small landowner also cannot grasp how important each and every acre of timberland will be in meeting our country's timber needs in the future. These landowners are also unwilling to invest in forest management practices to increase production on their land.

Low pulpwood prices are the rule in WRPA 8. This is one very important factor contributing to landowner apathy. The concerned small landowners feel their timber is worth more and would rather wait and hope for a price rise before thinning or not thin at all. Thus the low price of pulpwood is interfering with proper forest management that could help meet increasing timber needs. If thinning is delayed or not done at all, this also increases the possibility of Southern Pine Beetle attack because the timber stand is in a weakened condition.

Several logging problems are common in this area. Conscientiousness on the part of the logger in order to reduce damage to the residual timber is greatly needed. Large modern logging equipment operating at high speeds, tree length logging, and wet-weather logging with this machinery combine to damage the environment of the area being logged and to give landowners reason for apathy. Other logging problems include reluctance of loggers to cut small tracts and the lack of cutters in certain areas making hauling distance too long.

Indiscriminate dumping of trash on company and parish roads makes solid waste disposal a large problem in this area.

Hardwood competition on pine lands caused by young, tolerant, undesirable hardwood saplings forming a dense underbrush and shading out young pine seedlings and keeping new pine seed from germinating is an immense problem in parts of WRPA 8. Since fire protection has been established, many areas that once burned regularly now seldom burn and the brush problem has become unbearable.

Private industry owns hundreds of thousands of acres in WRPA 8 and these lands provide an endless variety of recreational opportunities including hunting, fishing, camping, motorcycle riding, hiking, and others. Some of the recreational uses are not compatible with forestry practices and others only if certain rules are adhered to. Conflicts do arise and occasionally cause an arson problem. In order to assure multiple use of these lands, which the companies are very much in favor of, education of the public of their responsibility to respect and not abuse private land is very important. Cooperation and communication between individuals and recreational groups and the companies are a must if the public is to continue to use private land.

Water

Development activities in WRPA 8 have increased silt loads and turbidity in the rivers and streams and have added to the natural degradation of these water bodies. Pesticides and herbicides from agricultural lands have the potential for making numerous lakes unsuitable for aquatic life, while waste discharges from municipal and industrial sources have degraded the quality of water in some streams, reducing their fishery potential and their suitability for some uses such as water contact recreation.

Line leaks are a major source of petrochemical pollution problems in WRPA 8, particularly in the Baton Rouge, Louisiana, area

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 8 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resource users, there is a short-term (1980) need to protect the environmental quality of 189 miles of scenic rivers and streams, and 860 acres of sparsely developed shoreline around scenic lakes. There are also short-term needs to protect several unique geological and botanical systems, and about 188,000 acres of bottomland hardwoods. In addition, there is a need to provide about 12,000 acres of open and green space in urban and built-up areas, and a need to solve problems associated with forest lands.

The locations of land and water areas needed for preservation of the natural environmental quality of WRPA 8 are shown on figure 10, while acreage needs are listed in table 9.

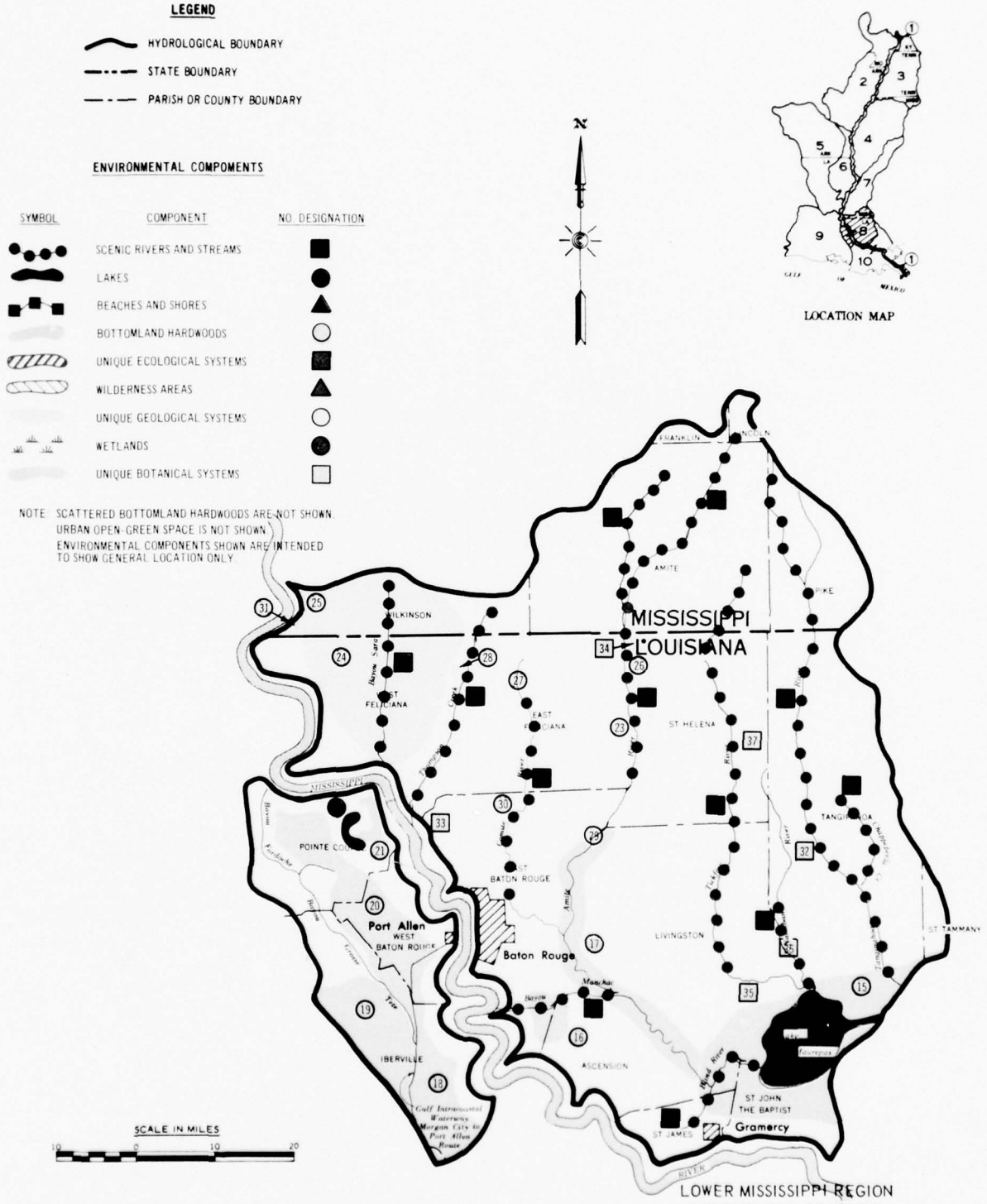

LEGEND
HYDROLOGICAL BOUNDARY
STATE BOUNDARY
PARISH OR COUNTY BOUNDARY
ENVIRONMENTAL COMPOMENTS
SYMBOL
COMPONENT
NO. DESIGNATION
SCENIC RIVERS AND STREAMS
LAKES
BEACHES AND SHORES
BOTTOMLAND HARDWOODS
UNIQUE ECOLOGICAL SYSTEMS
WILDERNESS AREAS
UNIQUE GEOLOGICAL SYSTEMS
WETLANDS
UNIQUE BOTANICAL SYSTEMS
NOTE: SCATTERED BOTTOMLAND HARDWOODS ARE NOT SHOWN.
URBAN OPEN-GREEN SPACE IS NOT SHOWN.
ENVIRONMENTAL COMPONENTS SHOWN ARE INTENDED TO SHOW GENERAL LOCATION ONLY.
N
LOCATION MAP
MISSISSIPPI
LOUISIANA
WILKINSON
AMITE
PIKE
FRANKLIN
ST. FELICIANA
EAST FELICIANA
ST. HELENA
TANGIPAHOA
POINTE COUPEE
WEST BATON ROUGE
Port Allen
ST. BATON ROUGE
Baton Rouge
LIVINGSTON
ST. TAMMANY
IBERVILLE
ASCENSION
ST. JOHN THE BAPTIST
Gramercy
ST. JAMES
Gulf Intracoastal Waterway Morgan City to Port Allen Route
SCALE IN MILES
10 0 10 20
LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY
NATURAL ENVIRONMENTAL QUALITY COMPONENTS
WRPA-8

FIGURE 10

TABLE 9. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 8

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Scenic Rivers & Streams[1]	Miles	(342)	(153)	(189)	Need per mile equals 48 acres of land and 12 acres of water.
1	Bayou Sara	Miles	27	0	27	Origin to Miss. R.
2	Thompson Creek	Miles	34	0	34	Origin to Miss. R.
3	Amite River (La.)	Miles	21	21	0	La.-Miss. State line to La. Hwy 37 (existing supply included in La. Natural & Scenic Rivers Act 398).
4	East Fork Amite River	Miles	32	0	32	Origin to La.-Miss. State Line.
5	West Fork Amite River	Miles	21	0	21	Origin to La.-Miss. State Line.
6	Comite River	Miles	17	17	0	Wilson Clinton Hwy to White Bayou (existing supply included in La. Natural & Scenic Rivers Act 398).
7	Tickfaw River	Miles	54	43	11	Origin to La. Hwy 42 (existing supply, La.-Miss. State Line to La. Hwy 42, included in La. Natural & Scenic Rivers Act 398).
8	Natalbany River	Miles	19	0	19	Origin to U. S. Hwy 190.
9	Tangipahoa River	Miles	69	40	29	Origin to I-12-xing (existing supply, La.-Miss. State Line to I-12-xing, included in La. Natural & Scenic Rivers Act 398).
10	Chappepeela Creek	Miles	12	12	0	La. Hwy 1062 to Jtn Tangipahoa R. (existing supply included in La. Natural & Scenic Rivers Act 398).
11	Blind River	Miles	20	20	0	Origin to Lake Maurepas (existing supply included in La. Natural & Scenic Rivers Act 398).
12	Bayou Manchac	Miles	16	0	16	Mississippi River levee to Amite River.
	Lakes[2]	Acres[3]	(61,950)	(61,090)	(860)	
13	False River	Acres	3,100	3,090	10	Provide access at one point - 10 ac. - and control shoreline on .55 miles.
14	Lake Maurepas	Acres	58,850	58,000	850	35 mi. of sparsely developed shoreline (acquire 850 acres which is a 200-ft strip along shore).
	Bottomland Hardwoods	Acres	(988,000)	(800,000)	(188,000)	
15	Swamps adjacent to Lakes Maurepas & Pontchartrain	Acres	259,000	210,000	49,000	Gross need est. as 70% of total area of 378,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
16	Spanish Lake Swamp	Acres	23,000	10,000	13,000	Gross need est. as 100% of total area of 23,000 ac. in forest measured from a 1:250,000 map dated 1967.
17	Amite River (2-mi. strip of forest adjacent to river)	Acres	50,000	45,000	5,000	Gross need est. as 100% of total area of 50,000 ac. in forest measured from a 1:250,000 map dated 1967.
18	Swamp below GIWW-Morgan City-Port Allen route & adjacent to Atchafalaya Basin	Acres	40,000	30,000	10,000	Gross need est. as 100% of total area of 40,000 ac. in forest measured from a 1:250,000 scale map dated 1967.
19	Swamp bounded by Bayou Grosse Tete, GIWW-Morgan City route, Atchafalaya Basin & I-10	Acres	60,000	45,000	15,000	Gross need est. as 80% of total area of 77,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
20	Swamp in vicinity of Upper Choctaw Bayou	Acres	89,000	70,000	19,000	Gross need est. as 100% of total area of 89,000 ac. in forest measured from a 1:250,000 scale map dated 1967.
21	Bayou Portage Swamp	Acres	9,000	9,000	0	Gross need est. as 20 % of total area of 45,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted for roads, open spaces, ditches, etc.).
22	Other (Scattered)	Acres	458,000	381,000	77,000	
	Unique Geologic Systems	Acres	(202,450)	(0)	(202,450)	
23	Bluff near Hatchers Quarters[1]	Acres	100	0	100	90-ft bluff.
24	Tunica Hills[2]	Acres	200,000	0	200,000	Hills up to 500 ft. - Mixed pine, hardwood forest.

TABLE 9. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 8 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Unique Geologic Systems - Cont.					
25	Waterfalls (vic. Pond, Miss.)	Acres	50	0	50	Classified as pastureland.
26	Fluker's Gorge 4/	Acres	500	0	500	Deep gorge on Dead River.
27	Tar Pits (E. Feliciana Parish) 4/	Acres	500	0	500	Site of fossils.
28	Bayou Sara - Percy Bluff	Acres	200	0	200	Plant remains. (Pasture)
29	Prehistoric Logs - E. Baton Rouge Parish 2/	Acres	100	0	100	34,000-yr. old log.
30	The Plains (E. Baton Rouge Parish)	Acres	500	0	500	Natural Prairie. (Pasture)
31	Bluffs and slump blocks overlooking the Miss. R. in the vic. of Ft. Adams 3/	Acres	500	0	500	
	Unique Botanical Systems	Acres	(1,851)	(151)	(1,700)	
32	Zemurray Gardens 6/	Acres	151	151	0	Garden containing camellias and azaleas.
33	Port Hudson (E. Baton Rouge Parish) 6/	Acres	100	0	100	
34	Chipola (St. Helena Parish) 5/	Acres	50	0	50	Stands of pines.
35	Clio (Livingston Parish) 4/	Acres	500	0	500	Virgin stands of cypress.
36	Spruce Pine Stands in Livingston & Tangipahoa Parishes 5/	Acres	1,000	0	1,000	
37	Pine stand (St. Helena Parish east of Tickfaw River) 5/	Acres	50	0	50	Old, very large loblolly pine stand with typical pine climax understory.
38	Urban Open-Green Spaces	Acres	11,500	500	11,000	Acreage required in urban areas.
	Total Land, All Components	Acres	(1,201,601)	(800,651)	(400,950)	
	Forests					
	Bottomland hardwoods		988,000	800,000	188,000	
	Other forest		201,100	0	201,100	
	Pasture		750	0	750	
	Urban		11,500	500	11,000	
	Other		251	151	100	
	Total Water, All Components	Acres	(65,050)	(62,850)	(2,180)	
	Large Water		61,090	61,090	0	
	Small Water		3,940	1,760	2,180	Surface area of scenic streams.

1/ 48 acres of land per mile (200 ft. strip along each bank) included in bottomland hardwoods category.
2/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.
3/ Includes water surface and/or land area along shore.
4/ Included in bottomland hardwoods category.
5/ Not included in bottomland hardwoods category.
6/ Classified as other lands.

W R P A 9

ENVIRONMENTAL SETTING

General

WRPA 9 covers an area of approximately 8.5 million acres, or about 12 percent of the Lower Mississippi Region. The entire planning area is located in southwestern Louisiana (figure 11). About 8 million acres of the area are land and the remaining 500,000 acres are water.

Major drainage basins within the planning area include the Calcasieu, Mermentau, Vermilion, and Atchafalaya Rivers, and Bayou Teche. All of these discharge into the Gulf of Mexico, and all except the Atchafalaya River originate within the WRPA. The Atchafalaya is a distributary of the Red and Mississippi Rivers. Principal tributaries of the Calcasieu River include Whiskey Chitto Creek, Burdick Creek, Hickory Creek, Beckwith Creek, Barnes Creek, West Fork Calcasieu River, Bayou Serpent, English Bayou, and Bayou Contraband. Bayous Nezpique, Plaquemine Brule, Des Cannes, Queue de Tortue, and Lacassine are principal tributaries of the Mermentau Rivers. The overall drainage system of the WRPA lies in three physiographic provinces: the Alluvial Valley, Southern Hills, and Coastal Marshes.

Land Forms

This terrain of WRPA 9 consists of hills, prairies, alluvial lowlands, and coastal marshes. A well-defined bluff line, known as the Opelousas Escarpment, follows a north-south direction about 2 to 8 miles west of Bayou Teche, and marks the divide between the alluvial lowlands to the east and the hill lands and prairies to the west. Extensive coastal marshes, a dominant feature, extend inland from the Gulf of Mexico a distance of 20 to 30 miles along the southern portion of the WRPA.

Ground elevations in the hill lands vary from about 20 to 250 feet above mean sea level. The landscape is largely covered by second-growth pine forests and the streams are confined in steep-walled valleys.

The prairies are generally flat and slope toward the south. Ground elevations are around 10 feet. Most of the prairie lands are cultivated. Trees are usually found only along the stream banks. Waterways in the prairie region have numerous natural and artificial connections that link them into a complicated system. There are some very interesting mounds 2 to 10 feet tall and up to 60 feet across on the prairies. It is possible that these may be a form of mud lumps or archeological sites. There are some bluffs where the prairies drop off to the marsh

land. Interesting features in some of the prairies are "trembling grounds." These are lands which tremble under the tread of man and cattle.

Surface slopes in the lowlands are very flat, and there are large areas of poorly drained land. The coastal marshland is an area of very low relief. Except for "cheniers" or sand ridges, the area is less than 2 feet in elevation. The sand ridges, such as the 2,000-year old Pecan Island, are old beach lines which parallel the coast and have a maximum elevation of about 11 feet. Roads are built to take advantage of these ridges and are therefore greatly restricted. Cheniers act as barriers to north-south water movement. In the past, they were extensively farmed. Cattle grazing and localized row crops are the major land uses at present.

Land Use

Approximately 3.4 million acres (43 percent) of WRPA 9 are forested; this represents 11 percent of the forest land in the Lower Mississippi Region.

Agricultural land in cropland and pasture accounts for 44 percent of the land in the planning area. Approximately 1.8 million acres are classified as cropland and 1.7 million acres are classified as pasture.

Urban and built-up areas account for 3 percent of WRPA 9, and the remaining 10 percent is in other miscellaneous uses.

Water Bodies

Rivers and Streams

The major streams in WRPA 9 are Bayou Teche and the Calcasieu, Mermentau, Vermilion, and Atchafalaya Rivers. These rivers and their tributaries are used to varying degrees for navigation, water supply, recreation, and fish and wildlife purposes.

The Calcasieu River rises in central Louisiana and follows a southerly course for about 215 miles to discharge into the Gulf of Mexico through Calcasieu Lake and Calcasieu Pass. In the upper part of the Calcasieu basin, the river and its tributaries are clear, swiftly running streams. As the river nears Lake Charles, however, it changes to a sluggish tidal stream, typical of the bayous of southwestern Louisiana. Below Lake Charles, a deep water ship channel has been constructed in the river.

The Mermentau River is formed by the confluence of Bayou Nezpique and Bayou Des Cannes and flows in a general southwesterly direction

through Lake Arthur and Grand Lake and thence to the Gulf of Mexico, a distance of about 69 miles. Navigation works in the Mermentau Basin include channels constructed in the Mermentau River from the Intracoastal Waterway to the junction of Bayous Nezpique and Des Cannes, in the lower 25 miles of Bayou Nezpique, and in the lower 9 miles of Bayou Des Cannes. The Mermentau River system is controlled by four structures - Catfish Point Control Structure, Calcasieu Lock, Vermilion Lock, and Schooner Bayou Control Structure - which impound winter runoff for use during the summer irrigation season. The lock and control structures also function to protect the impounded water from contamination by saline water from the Gulf of Mexico, Calcasieu River, and Vermilion Bay.

The Vermilion River is formed by the confluence of Bayous Fusilier and Bourbeaux and traverses a total distance of about 73 miles to its mouth at Vermilion Bay. It interconnects with Bayou Teche through Bayou Fusilier and Ruth Canal. Bayou Teche has its source in Bayou Courtableau at Port Barre, Louisiana, and flows in a southeasterly direction, a distance of about 125 miles, to its junction with the Lower Atchafalaya River, 10.5 miles above Morgan City. Bayou Teche is a comparatively small stream, occupying the highest part of a very large alluvial ridge. Since all local drainage is away from the stream, it functions as a flume, conveying drainage from the Bayou Rapides-Bayou Cocodrie-Bayou Courtableau-West Atchafalaya Basin protection levee borrow pit system to the Vermilion River and Lower Bayou Teche. Keystone Lock and Dam on Bayou Teche was constructed to provide a navigation channel to Arnaudville and subsequently raised to increase the diversion through Ruth Canal to Vermilion River for irrigation.

The Atchafalaya River, shown in the vicinity of Grand Lake, is one of the most significant streams in the region

The Atchafalaya River is a distributary for water from the Red and Mississippi Basins. It carries all the flow of the Red River and a substantial portion of the Mississippi River southward for about 55 miles. Under the 1928 Flood Control Act and amendments, a central channel was dredged from about mile 55 to Grand Lake; later improvements have enlarged and extended the central channel to Stouts Pass. Flow from the Atchafalaya Basin empties via Wax Lake Outlet and the Lower Atchafalaya River into Atchafalaya Bay. The Atchafalaya River and Central channel have a total distance of about 135 miles. The main channel varies in width from 200 to 400 feet and in depth from 15 to 160 feet. Flow from the Mississippi River is regulated by the Old River Control Structure, which was constructed to prevent the Atchafalaya River from capturing the Mississippi River.

Natural Lakes

The largest natural lake in WRPA 9 is White Lake, a 53,000 acre water body which is used for fish and waterfowl purposes and which is highly important to estuarine species. Other natural lakes include two coastal lakes and an oxbow lake. The coastal lakes are Calcasieu Lake, 42,880 acres, and Grand Lake, 40,000 acres. Calcasieu Lake is used as a major nursery area for estuarine species and is of high value to fish and waterfowl. Grand Lake receives high waterfowl use and fishing use. The oxbow lake known as Old River Lake is an oxbow of the Mississippi River. It is used for recreation, fishing, and waterfowl purposes. The oxbow facilities are shared with WRPA 1.

Man-made Impoundments

There are several small reservoir projects completed or being planned by the U.S. Soil Conservation Service under upstream watershed programs in WRPA 9. These projects are primarily for flood prevention, but at least three are multiple-purpose including recreation and irrigation. In addition, numerous farm ponds for livestock water or recreation (fishing) have been constructed in the WRPA.

HISTORICAL BACKGROUND

Land Resources

In pioneer days the upper half of WRPA 9 was pure pine virgin timber and the lower half was virgin cypress. The principal cypress swamp area extended south and west of Baton Rouge, bounded on the east by the Mississippi River. It extended west to Bayou Teche and south to the Gulf of Mexico. The cypress grew abundantly also along the Mermentau and Calcasieu Rivers. Settlers moved in along ridges and streams.

In the early 1700's the first crude sawmills were put into operation in the flatlands of southwest Louisiana. Cypress logs were cut in the swamps from boats and rafts and floated or dragged through the swamp and out to sawmills to be cut into boards. Cypress was an item of export as early as 1730.

In the period between the turn of the 19th Century and the Civil War, many mechanical changes were made in the sawmill business but the lumber market developed slowly. There was no capital for investment, no readily available labor force, and no cross-country transportation. However, Dr. Charles Mohr wrote before 1860 that the pine had been cut along major rivers and their tributaries, including the Calcasieu River. At that time it was most probably within a 2-mile strip of the river transportation. Some lumber was shipped by schooner from Lake Charles to Mexican ports.

The greatest developments in the lumber trade took place after the Civil War, and the groundwork was laid for extensive clearing of southern forest lands. During the period 1870-1900, the lumber industry, responsive to demands of northern markets for more wood, began migrating from depleted northern timber stands to the South. Railroad transportation was expanded and new mechanical equipment, such as the overhead logging cableway steam skidder and railroad skidders, became available. These things in combination with available capital and labor made the time right for harvesting the mature and overmature virgin pine and virgin cypress in WRPA 9.

By the turn of the 20th Century, virgin timber cutting was well underway in southeast Louisiana. The peak was reached in 1913. This period when the lumber industry cut over Louisiana was called the "Golden Era" and it encompassed the days of the big sawmills. For example, in 1908 the largest sawmill in the world was built at Bogalusa, Louisiana. This one mill, owned by the Great Southern Lumber Company and utilizing virgin pine from southeast Louisiana and southern Mississippi, moved an average of 1 million board-feet of lumber each day.

The clearcutting of mature and overmature virgin timber drew to a close in the 1930's. The number of sawmills then dropped dramatically;

mills shut down, leaving behind ghost towns, unemployment, and desolation in the form of thousands of acres of cutover lands. After the clearcutting days much of southwest Louisiana was in absentee ownership. This "free range" flatlands became sheep country. Very small landowners grazed thousands of sheep on the open land of others.

Renewed demands for timber during World War II required cutting anything that was left over from the big sawmills. Many small portable mills sprang up to cut 2 x 4's and other small dimension lumber wherever timber could be found. This not only filled the war demands - it resulted in cutting millions of feet of cull timber which was made into useful products. As a by-product, it cleared from the land undesirable growth and trees that could never have been harvested economically under normal conditions.

The past quarter-century has been an era of reforestation, putting thousands of acres of previously cleared land back into trees. It has further been an era of expanding fire detection and suppression, beginning tree improvement through forest genetics, developing cull hardwood removal methods, combating hardwood competition in pine areas, beginning hardwood management, intensifying pine management, developing insect and disease control methods, and beginning large scale recreation plans. Industries have practiced intensive management of their forest lands to insure permanent supplies of timber, and legislation has been passed to make it economical for industries to grow trees. The Forest Taxation law of 1954, in particular, has been an asset to timber growing.

In 1970 the gross product originating from forestry in WRPA 9 amounted to approximately $16 million, or about 9 percent of the gross product originating from agriculture in that area. This ratio not only signifies the relative economic importance of the area's forestry and agriculture, it also provides a pertinent clue as to why more than 4 out of every 10 acres of the planning area have been cleared for the cultivation of crops or for pasture. The terraces of WRPA 9 offer excellent possibilities for agriculture and have historically been used for that purpose. Important crops today include cotton, corn, sweet potatoes, rice, and sugar cane.

Over the years, the fertile terraces that have allowed for successful agricultural production have also been found to contain valuable mineral resources, including oil. Consequently, the oil industry is now a major economic force in the area, and Lafayette has become one of Louisiana's chief centers for oil development.

The coastal marshes too have always been quite productive and have been termed the Grand Central Depot for the migratory game birds of the Mississippi Valley. Seventy-five percent of the migratory game birds of the eastern United States and Canada stop here. Not only does the area abound in wild duck and geese for the hunter, but the inland waterways and the Gulf of Mexico provide a wonderful opportunity for the

sport fisherman as well as for commercial purposes. Off the coast of WRPA 9 are some of the best shrimping grounds in the entire Gulf area. Hence, much of the industry that has developed in the area is related to commercial fishing.

Water Resources

In the early history of WRPA 9, water played an important role not only as a means of transportation, but also as a source of food, water supply, and recreation. In more recent years, it has been increasingly used for industrial purposes. These many uses have entailed noticeable alterations of the natural environment, with some of the most apparent changes being those associated with channel works for navigation and flood control.

One of the earliest alterations consisted of the removal of obnoxious aquatic plant growths from navigable streams and waterways. This type of work was initiated in 1900 and is continuing. Other alterations to benefit navigation have included the snagging, enlarging, and straightening of natural channels, and the construction of man-made canals.

As early as 1914 a navigation channel was completed on the Atchafalaya River from Morgan City to the Gulf, a distance of approximately 16 miles. The next year a navigation channel was completed in the lower 19 miles of Bayou Plaquemine. Bayou Queue De Tortue was cleared and straightened in 1923, and in 1924 construction was completed on an inland waterway from Bayou Teche near Franklin, Louisiana, to the Mermentau River, with locks at Hanson Canal and Schooner Bayou. Since that time, additional projects for navigation have been completed on the Atchafalaya River, Bayou Teche and the Vermilion River, Big Pigeon and Little Pigeon Bayous, Calcasieu River, Freshwater Bayou, Mermentau River, and Petit Anse, Tigre, and Carlin Bayous.

Some of the rivers that have been modified for navigation have been additionally modified for flood control purposes. Included among these are Bayou Teche and the Vermilion and Mermentau Rivers. Other streams throughout the area have been modified exclusively for flood control. Initial Federal works for this purpose were completed on Bayou Des Glaises in 1939. Since then, Federal and State projects for flood control in WRPA 9 have involved channel modification on more than 4,000 miles of levees, and related facilities. Details on the existing and proposed projects can be found in Appendix D, Inventory of Facilities.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in this appendix, the most significant environmental quality component of WRPA 9 is the Atchafalaya Floodway, whose 555,000 acres of bottomland hardwoods include extensive wilderness areas and wetlands. This area alone accounts for 35 percent of the total bottomland hardwood acreage in the WRPA. In addition to the bottomland hardwoods, there are scenic rivers and streams and lakes scattered throughout the area. There is also a variety of unique geological and botanical systems, and there are several hundred miles of significant beaches and shores and thousands of acres of wetlands in the coastal portion of the area.

Scenic Rivers and Streams

A portion of Bayou Cocodrie and portions of Mill, Ten Mile, Six Mile, and Whiskey Chitto Creeks have been designated for protection in State legislation (Louisiana Natural and Scenic Rivers Act 398). In addition to these, portions of Spring Creek, Upper Bayou Cocodrie, Bayou Taureau, Beckwith Creek, Hickory Branch, and the Calcasieu River are scenically attractive and merit consideration for preservation in their existing condition.

Lakes

Within the hydrologic boundary of WRPA 9 there are at least five natural lakes whose scenic setting and sparsely developed shorelines are of such special value that they merit being maintained in their existing state as an inheritance for future generations. The largest of these is White Lake, covering 53,000 acres. Next is Grand Lake, covering 40,000 acres. Others are Lake Gausse Pointe, 16,400 acres; Lake Pearl, 550 acres; and Charlo Lake, covering a little less than 70 acres.

Bottomland Hardwoods

The remaining stands of bottomland hardwoods in WRPA 9 range in size from about 10,000 to 555,000 acres. Whether these hardwood forests are viewed as sources of commercial timber, havens for wildlife and waterfowl, unsightly breeding grounds for obnoxious vipers and mosquitoes, areas of scenic splendor and scientific interest, or otherwise, depends upon the perception of the viewer. In any case, the bottomland hardwoods represent part of a vanishing natural resource of national significance, and as such merit express consideration in plans and programs for the future use of the area's water and related land resources.

The extensive bottomland hardwood forests in the Atchafalaya wetlands are outstanding natural areas

Beaches and Shores

WRPA 9 is fronted by the Gulf of Mexico. To the extent that the area's environmental quality components can be expressed in terms of beaches and shores, there are more than 100 miles of undeveloped Gulf shoreline exposed, and there are more than 300 miles of undeveloped bay, lake, and estuarine shoreline. Of the total undeveloped shoreline, less than 40 percent is currently in public ownership.

Unique Geological Systems

In terms of area covered, the most significant geological system in WRPA 9 consists of 3,000 acres of natural sand deposits on Sangamar Beach Ridge. In addition to these deposits, significant geological systems have been identified at 11 other locations in the WRPA. Of the eleven, three are natural sand deposits and five are salt domes. One is a mineral well. Another is a natural spring, and the remaining system is a 600-acre cypress swamp. The smallest sand deposit covers 50 acres, while the salt domes vary in size from 100 to 500 acres.

Bird City, in Jungle Gardens, is one of the many outstanding features of Avery Island

The coastal marshes of WRPA 9 are an outstanding outdoor laboratory for environmental research and recreation

Unique Botanical Systems

A 200-acre jungle garden and bird sanctuary at Avery Island comprises one of five identified botanical systems having significance from an environmental quality standpoint. The other four consist of an arboretum at Chicot State Park; 500,000 acres of virgin coastal marsh in Cameron and Vermilion Parishes, Louisiana; timber stands in a natural shallow pond; and 80 acres of virgin bald cypress-tupelogum.

Wilderness Areas

The Atchafalaya Floodway, encompassing 555,000 acres below Krotz Springs, Louisiana, is the only recognized significant wilderness area in the WRPA. This is a wetland area covered by bottomland hardwoods.

Wetlands

Significant wetlands other than those in the Atchafalaya Floodway include 96,000 acres in the Morganza Floodway. They also include 300,000 acres in the Mermentau Basin (marsh) and 15,000 acres along Chenier Au Tigre.

The Atchafalaya Floodway, below Krotz Springs, Louisiana, is a massive, tremendously productive wilderness area

MAJOR ENVIRONMENTAL PROBLEMS

Land

To the extent that environmental problems can be expressed in terms of forest fires, poor forest management practices, insects, disease, and the like, these problems are much the same in the northern and western portions of WRPA 9.

The number and average size of wildfires that occur in these areas have been greatly reduced in recent years, but their potential destructiveness has increased. This is due to the successful reforestation program over thousands of acres and subsequent high timber value standing on each acre. The adverse contribution of wildfire to atmospheric pollution is another aspect that cannot be overlooked.

Low stumpage prices paid for pulpwood-size timber have deterred small forest landowners from becoming interested in or investing in better forest management practices. This is basically a problem of insufficient financial incentive coupled with a relatively long period of growing before any returns are realized.

Insects and disease are causing serious economical and environmental losses. The Southern Pine Beetle, in particular, is creating problems of epidemic proportions. The most serious disease is Cronartium fusiforme.

Additional problems in the northern and western portion of the WRPA stem from poor seedling survival and unsuitable logging equipment. Poor quality (cull) hardwoods are a major problem in the management of pure pine stands, and social problems due to low personal income tend to compound the wildfire and litter pollution problems of the area.

In the southern portion of the WRPA, there is a great demand for land for industrial development, homes, and farms. Consequently, woodland takes a back seat to most everything else. Recent developments in soybean production and supply have driven prices to all time highs. People who have land are growing more and more soybeans. In many instances, a great deal of woodland not suited to soybeans is being cleared for soybean production. When several crops fail, the cleared areas may be converted to pasture.

Poor past markets, low pulpwood prices, unscrupulous operators, ignorance of good forest management practices and of possible early economic returns from timber thinning have all tended to discourage timber growing and led to low management levels.

Heavy stands of bald cypress and tupelogum in deep water swamps cover large areas in the southern portion of the WRPA. Many of these

areas need thinning, but there is at present no log skidding machinery capable of operating in the water or over stumps and mud.

Aside from the forest related environmental problems in WRPA 9, there are many others stemming from both natural and man-made causes. Until fairly recent times, natural sediment deposition in marshland areas had outweighed natural destructive processes (erosion and subsidence) to the extent that there had been a net increase in land area. With leveeing of the Mississippi River, however, the fresh water and sediment that once flowed normally over the marshlands is now channeled down the river and deposited in deep water off the Continental Shelf in the Gulf of Mexico. As a result, natural erosion and subsidence are now the dominant processes in the marshland area, and there has been a substantial rate of land loss during the past 30 years.

Another significant natural factor affecting the rate of land loss is animal activity. Muskrats, nutria, and geese are capable of destroying considerable areas of marsh through their intensive feeding habits. Eat-outs, as affected areas are called, may range in size from less than an acre, in the case of localized goose feeding, to thousands of acres as a result of muskrat or nutria damage. Muskrat damage is often very severe since the entire root system of soil-stabilizing terrestrial plants is often destroyed. The decaying vegetation stagnates and the stagnant conditions contribute to further plant and animal die-offs. Areas of eat-outs may gradually revegetate but may become shallow ponds and lakes. In general, the areas of greatest land loss in the WRPA are associated with high muskrat and nutria populations.

A further natural (and man-made) problem is that of salt water intrusion which detracts from the quality of the coastal marshes for fish and wildlife habitat. Such intrusion has occurred at a considerable rate in the marshes of southwest Louisiana. Vegetation type maps produced in 1945 and 23 years later (1968) indicate that saline marsh has advanced landward 2 to 5 miles during that period.

In addition to natural processes, man-made changes have also had a measurable impact on the coastal marshes, especially with regard to the land-water ratio. Statistical data are unavailable on a WRPA basis, but studies of the Louisiana coastal marshes indicate that man-made water bodies, canals, waterways and impoundments, comprised approximately 1 percent of the water area in 1940 and 4.3 percent in 1970. Many of the water projects have interrupted natural hydrologic patterns, some have temporarily increased erosion rates, and most have caused some disruption of ecological systems within their local area of influence.

Land drainage projects for agricultural, industrial, and residential development have caused localized damage to natural marshes. Such projects not only result in direct habitat alteration, they also contribute indirectly to pollution and associated changes in adjacent

habitat areas. Agricultural, industrial, and urban wastes indiscriminately added to the natural ecological system pose a threat to the marshes and estuaries.

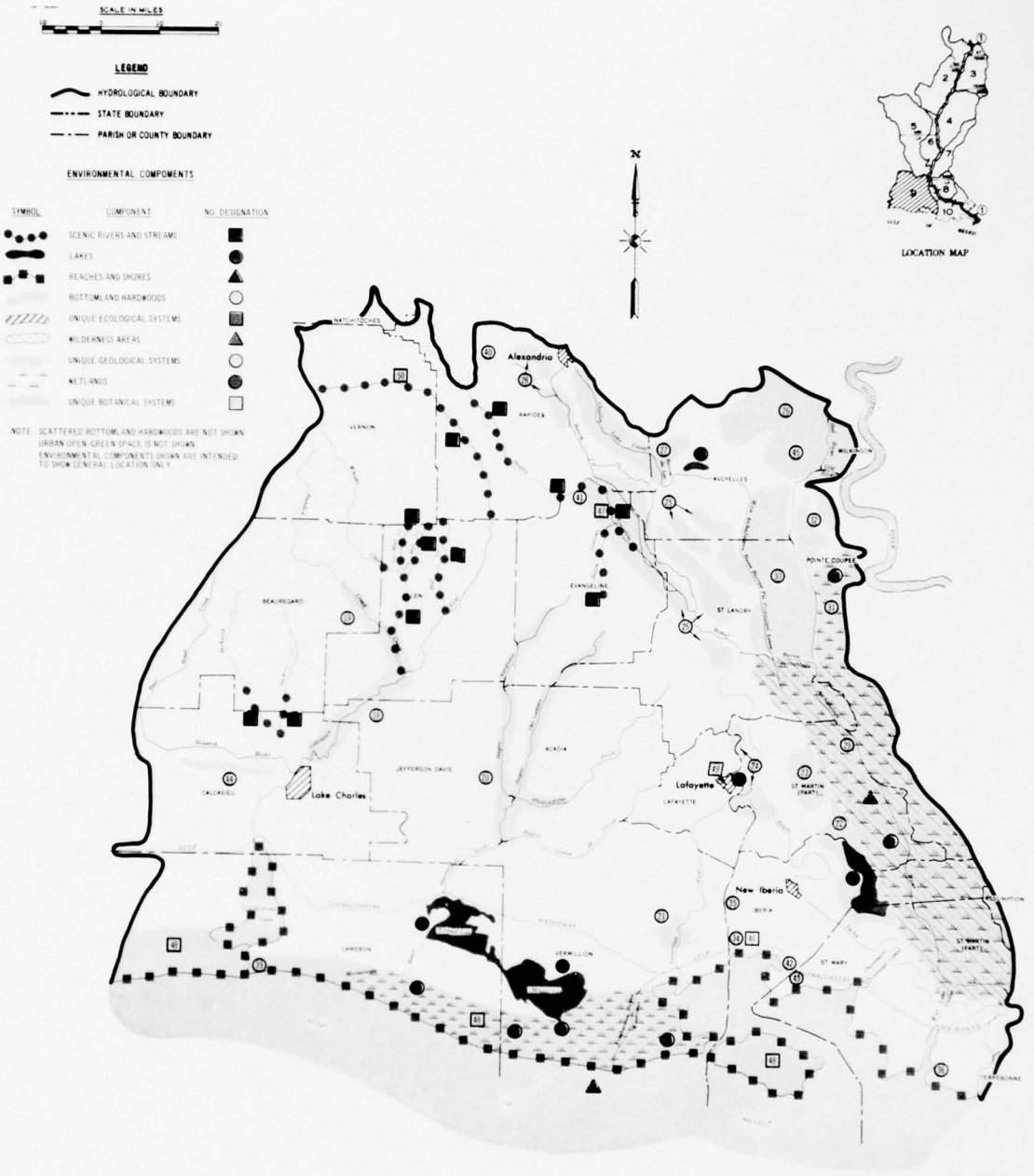
Water

Development activities in WRPA 9 have increased silt loads and turbidity in the rivers and streams and have added to the natural degradation of these water bodies. Pesticides and herbicides from agricultural lands have the potential for making numerous lakes unsuitable for aquatic life, while waste discharges from municipal and industrial sources have degraded the quality of water in some streams, reducing their fishery potential and their suitability for some uses such as water contact recreation.

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 9 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resource users, there is a short-term (1980) need to protect 63 miles of scenic rivers and streams in addition to approximately 564,600 acres of land and other water areas. The lands needed for environmental quality purposes include 244,000 acres of bottomland hardwoods, 5,600 acres of unique geologic systems, 200,200 acres of unique botanical systems, 555,000 acres of wilderness area (included in bottomland hardwood areas). They also include about 300 miles of beaches and about 3,500 acres of undeveloped shoreline at five natural lakes needed for environmental quality purposes. The five lakes collectively cover almost 110,000 acres. In addition, there is a short-term need to provide approximately 11,000 acres of open and green space in urban areas.

The locations of land and water areas needed for preservation of the natural environmental quality of WRPA 9 are shown in figure 11. The acreage needs are summarized in table 10.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 9

FIGURE 11

TABLE 10. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 9

Map Ref. No.	Environmental Quality Component	Units	Gross Needs	Existing Supply	Net Need	Remarks
	Scenic Rivers & Streams[1]	Miles	(179)	(116)	(63)	Need per mile equals 48 acres of land and 12 acres of water.
1	Bayou Cocodrie	Miles	22	22	0	U. S. Hwy 167 to the Bayou Boeuf-Cocodrie Diversion Channel.
2	Mill Creek	Miles	19	19	0	Allen Parish line to its entrance into Calcasieu River.
3	Ten Mile Creek	Miles	15	15	0	Allen Parish line to its entrance into Whiskey Chitto Creek.
4	Six Mile Creek	Miles	11	11	0	Allen Parish line to its entrance into Whiskey Chitto Creek.
5	Whiskey Chitto Creek	Miles	27	27	0	Beauregard Parish line to its entrance into Calcasieu River.
6	Spring Creek	Miles	22	22	0	Otis, La., to Cocodrie Lake.
7	Upper Bayou Cocodrie	Miles	5	0	5	5 miles above U. S. Hwy 167.
8	Bayou Taureau	Miles	6	0	6	6 miles above junction with Bayou Cocodrie.
9	Beckwith Creek	Miles	7	0	7	Lower 7 miles.
10	Hickory Branch	Miles	5	0	5	Lower 5 miles.
11	Calcasieu River	Miles	40	0	40	Upper 40 miles.
	Lakes[2]	Acres[3]	(113,440)	(109,950)	(3,490)	
12	Grand Lake	Acres	41,300	40,000	1,300	52 mi. of sparsely developed shoreline (acquire 1,300 ac. which is a 200-ft strip along shore).
13	White Lake	Acres	53,970	53,000	970	40 mi. of sparsely developed shoreline (acquire 970 ac. which is a 200-ft strip along shore).
14	Lake Fausse Pointe	Acres	17,400	16,400	1,000	42 mi. of sparsely developed shoreline (acquire 1,000 ac. which is a 200-ft strip along shore).
15	Lake Pearl	Acres	700	550	150	6 miles of sparsely developed shoreline (acquire 150 ac. which is a 200-ft strip along shore).
16	Charlo Lake	Acres	70	0	70	Lake and surrounding swamp area (acquire 70 acres).
17	Beaches & Shoreline[4]	Miles	(420)	(165)	(255)	Classified as other lands.
	Gulf Shoreline Exposed					
	Ocean View Beach to S.W. Pass	Miles	92	55	37	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Marsh Island (lighthouse Point to South Point)	Miles	21	21	0	Gross need equal to undeveloped shoreline. All shoreline is in public ownership; therefore, considered existing supply.
	Bays, Lakes & Estuaries Shoreline					
	Calcasieu Lake	Miles	59	26	33	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Vermilion	Miles	78	31	47	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	East & West Cote Blanche Bays	Miles	77	32	45	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Atchafalaya Bay	Miles	93	0	93	Gross need equal to undeveloped shoreline. All undeveloped shoreline is in private ownership.
	Bottomland Hardwoods	Acres	(1,324,000)	(1,080,000)	(244,000)	
18	Calcasieu River (strip of forest adjacent to river)	Acres	40,000	33,000	7,000	Gross needs est. as 90% of total area of 44,000 ac. in forest measured from a 1:250,000 scale map dated 1960 (percentage subtracted is for roads, open spaces, ditches, etc.).
19	Bundicks Creek - Whiskey Chitto Creek (strip of forest adjacent to river)	Acres	15,000	12,000	3,000	Gross needs est. as 90% of total area of 16,500 ac. in forest measured from a 1:250,000 scale map dated 1960 (percentage subtracted is for roads, open spaces, ditches, etc.).

TABLE 10. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 9 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Bottomland Hardwoods - Cont.					
(20)	Mermentau River System (strip of forest adjacent to river)	Acres	67,000	55,000	12,000	Gross needs est. as 90% of total area of 74,500 ac. in forest measured from a 1:250,000 scale map dated 1960 (percentage subtracted is for roads, open spaces, ditches, etc.).
(21)	Lower Vermilion River	Acres	9,000	7,000	2,000	Gross needs est. as 90% of total area of 10,000 ac. in forest measured from a 1:250,000 scale map dated 1959 (percentage subtracted is for roads, open spaces, ditches, etc.).
(22)	Around Lake Fausse Pointe	Acres	55,000	45,000	10,000	Gross needs est. as 96% of total area of 57,400 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(23)	Vicinity of Berard Canal	Acres	20,000	16,000	4,000	Gross needs est. as 93% of total area of 21,500 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(24)	Between Vermilion & Bayou Teche	Acres	25,000	20,000	5,000	Gross needs est. as 87% of total area of 28,700 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(25)	Between W. Atchafalaya River Levees and Bayou Cocodrie	Acres	94,000	77,000	17,000	Gross needs est. as 54% of total area of 175,000 ac. in forest measured from a 1:250,000 scale map dated 1960 (percentage subtracted is for roads, open spaces, ditches, etc.).
(26)	Bayou de Glasse Loop	Acres	160,000	131,000	29,000	Gross needs est. as 80% of total area of 200,000 ac. in forest measured from a 1:250,000 scale map dated 1960 (percentage subtracted is for roads, open spaces, ditches, etc.).
(27)	Chatlin Lake Canal Area	Acres	38,000	31,000	7,000	Gross needs est. as 50% of total area of 75,000 ac. in forest measured from a 1:250,000 scale map dated 1961 (percentage subtracted is for roads, open spaces, ditches, etc.).
(28)	Vicinity of Alexandria	Acres	20,000	16,000	4,000	Gross needs est. as 50% of total area of 40,000 ac. in forest measured from a 1:250,000 scale map dated 1961 (percentage subtracted is for roads, open spaces, ditches, etc.).
(29)	Atchafalaya Floodway below Krotz Springs	Acres	555,000	453,000	102,000	Gross needs est. as 100% of total area of 555,000 ac. in forest measured from a 1:250,000 scale map dated 1967.
(30)	West Atchafalaya Floodway	Acres	98,000	80,000	18,000	Gross needs est. as 70% of total area of 140,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(31)	Morganza Floodway	Acres	42,000	34,000	8,000	Gross needs est. as 70% of total area of 60,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(32)	Upper Pointe Coupe	Acres	20,000	16,000	4,000	Gross needs est. as 54% of total area of 37,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(33)	Scattered	Acres	66,000	54,000	12,000	
	Unique Geologic Systems	Acres	(5,620)	(20)	(5,600)	
(1)	Avery Island[5/]	Acres	500	0	500	Salt Dome.
(2)	Jefferson Island[5/]	Acres	500	0	500	Salt Dome.
(3)	Belle Isle[5/]	Acres	100	0	100	Salt Dome.
(4)	Pecan Island[5/]	Acres	50	0	50	Natural sand deposits.
(5)	Grand Chenier[5/]	Acres	50	0	50	Natural sand deposits.
(6)	Barrier Beach in Cameron Parish[5/]	Acres	50	0	50	Natural sand deposits.
(7)	Hot Wells near Alexandria[5/]	Acres	50	20	50	Mineral water flows from artesian wells.

TABLE 10. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 9 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Unique Geologic Systems - Cont.					
(41)	Bell Chaney Springs[5]	Acres	20	0	20	Spring.
(42)	Weeks Isle[5]	Acres	500	0	500	Salt Dome.
(43)	Cote Blanche[5]	Acres	200	0	200	Salt Dome.
(44)	Sanguinar Beach Ridge[6]	Acres	3,000	0	3,000	Natural sand deposits.
(45)	Pomme de terre[5]	Acres	600	0	600	Cypress swamp.
	Unique Botanical Systems[5]	Acres	(500,331)	(300,051)	(200,280)	
46	Avery Island	Acres	200	0	200	Jungle garden and bird sanctuary.
47	Arboretum (Chicot State Park)	Acres	50	50	0	
48	Coastal marsh (Cameron Parish and Vermilion Parish)	Acres	500,000	300,000	200,000	Virgin coastal marsh.
49	Natural Shallow Pond (U. S. L.)	Acres	1	1	0	Timber stands in pond traversing prairie region.
50	Cypress-tupelo (Calcasieu River in NE Vernon Parish)	Acres	80	0	80	Virgin cypress tupelo.
	Wilderness Areas[6]	Acres	(555,000)	(0)	(555,000)	
△51	Atchafalaya Floodway (Lower portion below Krotz Springs, La.)	Acres	555,000	0	555,000	
(52)	Urban Open-Green Space	Acres	12,300	1,300	11,000	Acreage required in urban areas.
	Wetlands	Acres	(966,000)	(300,000)	(666,000)	
(53)	Atchafalaya Floodway[6]	Acres	555,000	0	555,000	
(54)	Morganza Floodway	Acres	96,000	0	96,000	54,000 acres included in bottomland hardwoods category, 42,000 acres in botanical systems category.
55	Mermentau Basin (Marsh)	Acres	300,000	300,000	0	67,000 acres included in bottomland hardwoods category, 233,000 acres in botanical systems category.
56	Chenier Au Tigre	Acres	15,000	0	15,000	Included in botanical systems category.
	Total Land, All Components	Acres	(1,864,920)	(1,387,620)	(467,300)	
	Forests					
	Bottomland hardwoods		1,324,000	1,080,000	244,000	
	Other Forests		0	0	0	
	Pasture		0	0	0	
	Urban		12,300	1,300	11,000	
	Other		518,620	306,320	212,300	
	Total Water, All Components	Acres	(112,055)	(111,280)	(775)	
	Large Water		109,995	109,950	45	
	Small Water		2,060	1,330	730	Surface area of scenic streams.

1/ 48 acres of land per mile (200-ft. strip along each bank) included in bottomland hardwoods category.
2/ 200-ft. strip along shoreline (24 acres per mile) included in bottomland hardwoods category.
3/ Includes water surface and/or land area along shore.
4/ Gross and net needs equal 38 acres per mile, based on 200-ft. strip along shore, with additional allowance for erosion averaging 2.3-ft. per mile per year.
5/ Classified as other lands.
6/ Included in bottomland hardwoods category.

W R P A 10

ENVIRONMENTAL SETTING

General

WRPA 10, an area covering about 4.9 million acres, or 8 percent of the Lower Mississippi Region, lies in southeastern Louisiana in the Alluvial Valley and Coastal Marshes Physiographic Provinces (figure 12). About 3.8 million acres of the area are land, and 1.1 million acres are water. The Mississippi River separates the northern one-third of the WRPA from the southern two-thirds. The smaller area surrounds Lake Pontchartrain - a natural body of brackish water.

North of Lake Pontchartrain, WRPA 10 consists only of the Tchefuncte River Basin. South of the lake, the planning area is formed by seven major Mississippi River delta complexes, and is characterized by intertwining tidal channels and irregular water bodies. From oldest to youngest, the delta complexes are: Sale, Cypremont, Cocodrie, Teche, St. Bernard, Lafourche, Plaquemine, and Balize. Numerous man-made channels traverse the area.

Land Forms

The terrain north of Lake Pontchartrain consists of forested rolling hill lands and alluvial lowlands, with a fringe of tidal marsh along the shoreline of Lake Pontchartrain. In the hill lands, elevations range from about 50 to 300 feet above mean sea level, and steep-walled valleys confine the streams. Tidal marshes and swamps in the alluvial lowlands are located adjacent to streams and along the perimeter of the lake.

The area south of Lake Pontchartrain lies in the deltaic plain of the Mississippi River. It is characterized by a marsh, lake, and bay environment in the lower portion and by a swamp and lake environment in the upper portion. Land elevations range from zero to 20 feet above mean sea level, with the higher land located along the alluvial ridges of the Mississippi River and Bayou Lafourche. Lesser alluvial ridges, which exist along numerous smaller streams, range in elevation from 1 foot at their gulfward extremities to 10 feet in the northern part of the area.

Land Use

Approximately 1.3 million acres (35 percent) of WRPA 10 are forested; this represents 4 percent of the forest land in the Lower Mississippi Region.

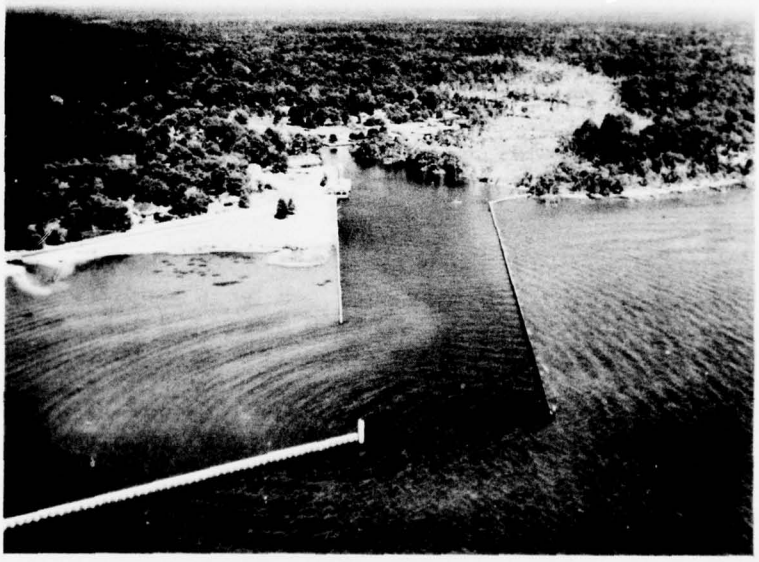
Agricultural land in cropland and pasture accounts for 15 percent of the land in the planning area. Approximately 310,000 acres are classified as cropland and 251,000 acres are classified as pastureland.

Urban and built-up areas account for 6 percent of WRPA 10, and the remaining 44 percent is in other miscellaneous uses, predominantly coastal dunes and marshes.

Water Bodies

Rivers and Streams

The only major river north of Lake Pontchartrain in WRPA 10 is the 50-mile-long Tchefuncte River, which is maintained for commercial navigation in its lower reaches. South of Lake Pontchartrain, the WRPA is composed of intertwining tidal channels and irregular water bodies, along with numerous man-made waterways. The major waterways are: Gulf Intracoastal Waterway, Barataria Bay Waterway, Mississippi River Gulf Outlet, Bayou Lafourche and Lafourche-Jump Waterway, and the Houma Navigation Canal. The Intracoastal Waterway, in addition to providing for commercial navigation needs, supplies water for operation of the A. B. Patterson steam plant in New Orleans. Details on navigation facilities can be found in Appendix D, Inventory of Facilities.



Although many segments along the shores of Lake Pontchartrain are highly developed, large tracts of undisturbed natural areas remain intact

Natural Lakes

Lake Pontchartrain is the largest natural lake in WRPA 10. It covers 398,000 acres, provides high fishing and waterfowl use, and contributes to the salt-water fishing of the region. This lake is easily accessible to New Orleans residents and is heavily used for swimming, boating, and related water-oriented recreation activities both by the people living in and those visiting the New Orleans area. Other natural lakes providing excellent fishing and waterfowl use in WRPA 10 include: Lac Des Allemands, 15,400 acres; Lake Cataouatche, 9,280 acres; and Lake Salvador, 44,800 acres.

Man-made Impoundments

Other than small farm ponds for livestock watering or recreation (fishing), there are no significant man-made impoundments in WRPA 10.

HISTORICAL BACKGROUND

Land Resources

Geographically, WRPA 10 is composed of the Mississippi River flood plain and the coastal marshes. The mouth of the river cuts through this area and has played a major role in its growth. The area south of the Mississippi River to the coastal marshes was virgin cypress timberland when settlers arrived. The principal cypress swamp area extended south of Baton Rouge and was bounded generally on the east by the Mississippi River and Lakes Maurepas and Pontchartrain. It extended west to Bayou Teche and south to the Gulf marsh. This area includes rich lowlands and "ridges" along streams. Immigrants of Spanish origin settled along the bayous and the river, and developed far-reaching indigo plantations after clearing some timbered areas. In due time the indigo plantations failed. Incoming French converted these lands to sugar cane plantations and cleared more land to extend the sugar cane producing area. These lands are still in agriculture.

This WRPA also includes pine and bottomland hardwood in St. Tammany Parish and pure pine in the southwest corner of Washington Parish. Though some of the pine timber was cleared by settlers, the major cutting of virgin pine in this WRPA was begun by the lumbermen shortly after 1700 when crude sawmills were introduced.

Logging the cypress swamps was most difficult in this area, being accomplished by pull boat and floating. In more recent times, in order to finish cutting the virgin cypress, some forest industries dug canals through the swamp country to float and raft the logs to the mills.

This hardwood area has never been under forest management because of the problems and length of time it takes to grow a crop of cypress - 125 to 350 years. Planting cypress was undertaken by the Rathborne Lumber Company in the 1950's and by the Garden City Lumber Company in the early 1960's. The introduction of nutria, a mammal larger than muskrat or mink, made such plantings virtually impractical. As cypress seedlings were planted (pushed into the mud bottom of the swamps) from boats, the nutria would follow at night, pull up the seedlings, and eat the roots.

Cypress has not reproduced itself in pure stands to replace the virgin cypress. Controversial drainage has made land use planning vague and unpredictable. Salt-water intrusion has also placed a shadow over the future use of this land bordering the coastal marshes.

Cypress was an item of export as early as 1730. In the early 1800's, the pine from logs from southeast Louisiana was rafted through Lake Pontchartrain and canals through the city of New Orleans for sawmills.

After the turn of the 19th Century, the longleaf pine belt of southeastern Louisiana drew attention. A naval store operation was located where Hammond, Louisiana, stands today. It shipped its products (tar, pitch, turpentine, pine oil, rosin, terpenes), obtained from the oleoresin of pine trees, to England and Western Europe.

The lumber industry attracted new businesses. Sawmilling, shipping, brickmaking, and storekeeping emerged. The lumber business branched out and sold weather boarding, planks, pickets, and rough grade lumber. Lumber was shipped to New Orleans by schooner via the Tangipahoa, Covington, Amite, and Pearl Rivers.

The circular saw took over shortly before the Civil War and replaced all other sawmill equipment. Equipment to harvest the virgin forest was developed just as the lumber industry moved south, and railroads were built to haul the wood. The overhead logging cableway steam skidder system was applied to a scow in the Louisiana swamp. Soon thereafter railroad skidders went into operation, so that by 1895 there were a number of pullboats and swamp railroads in Louisiana.

Virgin "tidewater" cypress has been cut. The last two mills completing the cutting were Ponchatoula Lumber Company, which completed its cutting in 1955, and Garden City Lumber Company, which closed about 10 years later.

Water Resources

Water bodies in this WRPA have probably played a greater role in history than others in the region. In past and present, water has been used as a mode of private and public transportation, for food sources, water supplies, wildlife habitat, and recreation. Water is also used by industrial and thermoelectric interests which are very important to the economy of this WRPA. Irrigation is not practiced extensively in this WRPA.

Navigation is increasing on the major streams in and bordering this WRPA. Many transportation and access canals have been dug in the coastal zone to support the tremendous mineral industry offshore and within the WRPA. Trappers use these water bodies for transportation and many live in houseboats close to their work. Commercial and pleasure fishing is practiced extensively in the coastal streams. All other forms of water recreation uses are prevalent throughout WRPA 10. Most of the communities in this WRPA depend on rivers and streams for water supply.

Natural lakes are used as wildlife habitats and for recreation, commercial fishing, and some transportation. Many of these lakes are linked together and to the Gulf of Mexico by man-made access canals.

Therefore, the mineral composition of the water in these water bodies may have changed through time.

The topography of this WRPA does not lend itself readily to the construction of reservoirs except in the extreme northeastern area where there is a good dependable supply of water. Therefore, the probability of the construction of man-made impoundments in this WRPA for uses other than recreation and conservation is small.

SIGNIFICANT ENVIRONMENTAL FEATURES

General

Within the context of environmental needs presented in this appendix, there is no single outstanding environmental quality component in WRPA 10. Among the variety of components to be found are three scenic rivers, nine lakes, almost 1,400 miles of beaches and shores, 1,135,000 acres of bottomland hardwoods, two unique geological systems and three unique botanical systems. These are discussed in more detail in the following paragraphs.

Scenic Rivers and Streams

In WRPA 10, portions of Bayou Penchant, Bayou Des Allemands, and the Tchefuncte River have been designated for protection in State legislation (Louisiana Natural and Scenic Rivers Act 398). The longest scenic reach, 42 miles, is along the Tchefuncte River. The other reaches are less than 30 miles in length.

Although the development in the foreground is typical of several reaches of the Tchefuncte River, many miles of the stream flow through heavily wooded natural areas as seen upstream in this photograph

Lakes

Within the hydrologic boundary of WRPA 10, there are known to be nine natural lakes whose scenic setting and sparsely developed shorelines are of such special value that they merit being maintained in their existing state as an inheritance for future generations. The largest of these is Salvador Lake, covering 44,800 acres. The others include Palourde Lake, 11,500 acres; Lake Verret, 14,080 acres; Natchez Lake, 500 acres; Cataouatche Lake, 9,280 acres; Little Lake, 23,600 acres; Lac Des Allemands, 15,400 acres; Lake Fields, 1,800 acres; and Lake Boudreaux, 3,000 acres.

Bottomland Hardwoods

The remaining stands of bottomland hardwoods in WRPA 10 range in size from about 44,000 to 266,000 acres. Whether these hardwood forests are viewed as sources of commercial timber, havens for wildlife and waterfowl, unsightly breeding grounds for obnoxious vipers and mosquitos, areas of scenic splendor and scientific interest, or otherwise, depends upon the perception of the viewer. In any case, the bottomland hardwoods represent part of a disappearing natural resource, and as such they merit express consideration in plans and programs for the future use of the area's water and related land resources.

Lake Verret is one of several scenic, productive lakes in WRPA 10

The mud lumps at the mouth of the Mississippi River are a fascinating natural phenomenon

Beaches and Shores

WRPA 10 is fronted by the Gulf of Mexico. To the extent that the area's environmental quality components can be expressed in terms of beaches and shores, there are almost 670 miles of undeveloped Gulf shoreline exposed, and there are 720 miles of undeveloped bay, lake, and estuarine shoreline. Of the total undeveloped shoreline, less than 30 percent is currently in public ownership.

Unique Geological Systems

Important geological systems in WRPA 10 consist of the Abita Springs and of mud lumps at the mouth of the Mississippi River. The springs are a natural phenomenon, covering 100 acres. The mud lumps cover 200 acres and are presently in public ownership.

Unique Botanical Systems

West Bayou Gardens in WRPA 10 cover only 25 acres but are an important asset to the region. These gardens are currently in private ownership and are expected to be maintained in their current condition. Aside from the gardens, the area's only botanical system of recognized significance consists of 200 acres of virgin swamp communities at Avondale and 800 acres of spruce pine stands in St. Tammany Parish.

MAJOR ENVIRONMENTAL PROBLEMS

Land

Urban sprawl, and its demand for land and water resources, has been and will continue to be the major environmental problem in WRPA 10.

Demand for timber products will encourage landowners to neglect forest management practices seeking return on investments rather than developing a renewable resource. The demand for food crops, together with all time high prices, will encourage the conversion of timber land to agricultural production. Marginal lands cleared for agricultural production that fail to produce may be converted to pasture lands rather than be returned to woodlands.

In the southern portion of the south Delta there exist large areas of very heavy stands of cypress and tupelogum in deep water swamps. Much of this area needs thinning but present technology limits machinery capability to operate in these areas.

Solid waste pollution is one of many problems stemming from urban congestion, particularly in the New Orleans, Louisiana, area

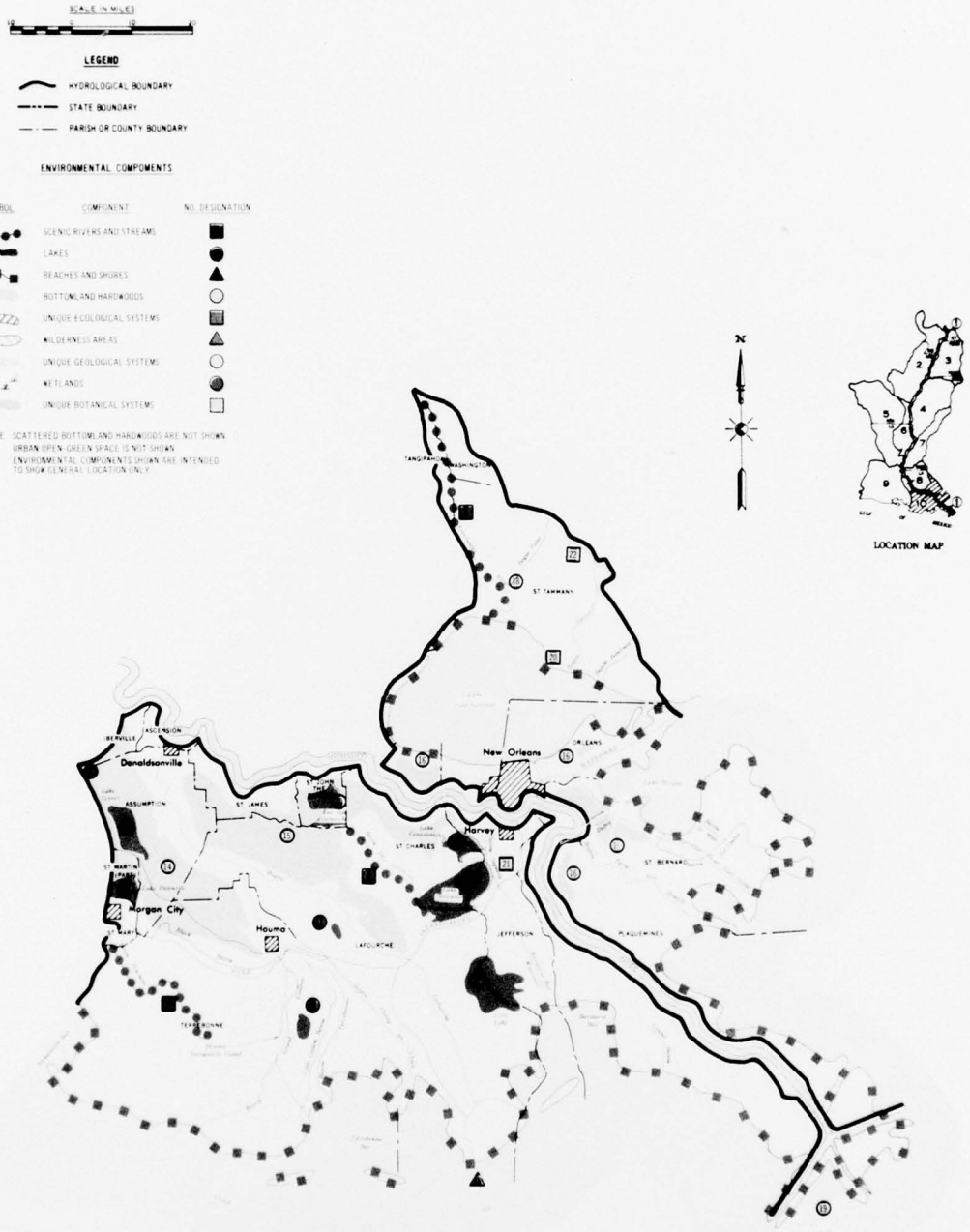
Water

Industrial and municipal pollution exists and will increase as urbanization continues. There is and will continue to be a demand for a good dependable water supply where excess chlorides and suspended solids are now a problem. As the demand for food rises and lands are drained, cleared and placed in production, the pollution of streams from agricultural runoff will increase.

Drainage projects, watershed management areas, and coastal access canals have altered the natural flow conditions through the WRPA. Natural degradation is occurring.

ENVIRONMENTAL NEEDS

If the significant environmental features of WRPA 10 are to fulfill their potential for contributing to the aesthetic enjoyment and scientific knowledge of future resource users, there is a short-term (1980) need to protect 90 miles of scenic rivers and streams. Steps in this direction have already been taken by the State of Louisiana. In addition, there is a need to protect approximately 196,500 acres of land and other water areas. The lands needed for environmental quality purposes include 190,000 acres of bottomland hardwoods, 100 acres of unique geologic systems, 1,000 acres of unique botanical systems, and 1,032 miles of beaches and shorelines. They also include 4,400 acres of undeveloped shorelines surrounding water bodies needed for environmental quality purposes. Such water bodies include nine existing lakes covering 123,280 acres. Further, there is a need to provide about 35,000 acres of open and green space at strategic locations in urban centers. The locations of land and water areas needed for preservation of the natural environmental quality of WRPA 10 are shown on figure 12. The acreage needs are summarized in table 11.



LOWER MISSISSIPPI REGION
COMPREHENSIVE STUDY

NATURAL ENVIRONMENTAL QUALITY COMPONENTS

WRPA 10

FIGURE 12

TABLE 11. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, ARPA 10

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Scenic Rivers & Streams [1]	Miles	(90)	(90)	(0)	Need per mile equals 48 acres of land and 12 acres of water.
1	Bayou Penchant	Miles	27	27	0	Bayou Chene to entrance into Lake Penchant (existing supply included in La. Natural & Scenic Rivers Act 398).
2	Bayou Des Allemands	Miles	21	21	0	Lac Des Allemands to Lake Salvador (existing supply included in La. Natural & Scenic Rivers Act 398).
3	Tchefuncte River	Miles	42	42	0	Origin to junction with Bogue Falaya River (existing supply included in La. Natural & Scenic Rivers Act 398).
	Lakes [2]	Acres [2]	(128,365)	(123,960)	(4,405)	
4	Palourde Lake	Acres	11,815	11,500	315	13 mi. of sparsely developed shoreline (acquire 315 ac. which is a 200-ft strip along shore).
5	Lake Verret	Acres	14,760	14,080	680	28 mi. of sparsely developed shoreline (acquire 680 ac. which is a 200-ft strip along shore).
6	Natchez Lake	Acres	600	500	100	4 mi. of sparsely developed shoreline (acquire 100 ac. which is a 200-ft strip along shore).
7	Catouatche Lake	Acres	9,670	9,280	390	16 mi. of sparsely developed shoreline (acquire 390 ac. which is a 200-ft strip along shore).
8	Little Lake	Acres	24,420	23,600	820	34 mi. of sparsely developed shoreline (acquire 820 ac. which is a 200-ft strip along shore).
9	Salvador Lake	Acres	45,800	44,800	1,000	42 mi. of sparsely developed shoreline (acquire 1,000 ac. which is a 200-ft strip along shore).
10	Lac Des Allemands	Acres	16,000	15,400	600	25 mi. of sparsely developed shoreline (acquire 600 ac. which is a 200-ft strip along shore).
11	Lake Fields	Acres	2,000	1,800	200	8 mi. of sparsely developed shoreline (acquire 200 ac. which is a 200-ft strip along shore).
12	Lake Boudreaux	Acres	3,300	3,000	300	12 mi. of sparsely developed shoreline (acquire 300 ac. which is a 200-ft strip along shoreline).
13	Beaches and Shoreline [4]	Miles	(1,386)	(354)	(1,032)	Classified as other lands.
	Gulf Shoreline Exposed					
	Point au Fer to Bayou Gareau	Miles	21	0	21	Gross need equal to undeveloped shoreline. All undeveloped shoreline is in private ownership; therefore, zero existing supply.
	Bayou Gareau to Sandy Point	Miles	91	18	73	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Sandy Point to California Point	Miles	215	161	54	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	California Point to Isle au Pitre	Miles	314	69	245	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Isle au Pitre to Pearl River	Miles	25	0	25	Gross need equal to undeveloped shoreline. All undeveloped shoreline is in private ownership; therefore, zero existing supply.
	Bays, Lakes & Estuaries Shoreline					
	Terrebonne & Timbalier Bays	Miles	213	19	194	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Caminada & Barataria Bays	Miles	162	10	152	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Bastion Bay	Miles	29	5	24	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Miss. River Passes	Miles	104	61	43	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.
	Lake Borgne	Miles	88	0	88	Gross need equal to undeveloped shoreline. All undeveloped shoreline is in private ownership; therefore, zero existing supply.
	Lake Pontchartrain	Miles	72	11	61	Gross need equal to undeveloped shoreline. Existing supply is undeveloped shoreline in public ownership.

TABLE 11. SUMMARY OF LAND AND WATER AREAS NEEDED BY 1980 FOR ENVIRONMENTAL QUALITY PURPOSES, WRPA 10 (CONTINUED)

Map Ref. No.	Environmental Quality Component	Units	Gross Need	Existing Supply	Net Need	Remarks
	Bays, Lakes & Estuaries Shoreline - Cont.					
	Rigolets & Chef Menteur Passes & Lake St. Catherine	Miles	52	0	52	Gross need equal to undeveloped shoreline. All undeveloped shoreline is in private ownership; therefore, zero existing supply.
	Bottomland Hardwoods	Acres	(970,000)	(780,000)	(190,000)	
(14)	Swamp Vicinity of Lakes Palourde and Verrett	Acres	175,000	140,000	35,000	Gross needs estimated as 70% of total area of 251,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(15)	Between Miss. R. & Bayou Lafourche	Acres	186,000	150,000	36,000	Gross needs estimated as 70% of total area of 266,000 ac. in forest measured from a 1:250,000 scale map dated 1967 (percentage subtracted is for roads, open spaces, ditches, etc.).
(16)	Between Miss. R. & Lake Pontchartrain	Acres	35,000	28,000	7,000	Gross needs estimated as 80% of total area of 44,000 ac. in forest measured from a 1:250,000 scale map dated 1962 (percentage subtracted is for roads, open spaces, ditches, etc.).
(17)	Scattered	Acres	574,000	462,000	112,000	Remaining bottomland hardwoods.
	Unique Geologic Systems[5]	Acres	(300)	(200)	(100)	
(18)	Abita Springs	Acres	100	0	100	Natural spring.
(19)	Mud Lumps - Mouth of Miss. R.	Acres	200	200	0	Mud Lumps. (public ownership)
	Unique Botanical Systems[6]	Acres	(1,025)	(25)	(1,000)	
[20]	West Bayou Gardens	Acres	25	25	0	Gardens in private ownership (expected to remain in present state).
[21]	Avondale	Acres	200	0	200	Virgin swamp communities in private ownership (acquire gross need for future).
[22]	Spruce Pine Stands in St. Tammany Parish	Acres	800	0	800	(Acquire gross need for future.)
(23)	Urban Open Green Space	Acres	31,300	1,300	30,000	Acreage required in urban areas.
	Total Land, All Components	Acres	(1,162,625)	(822,525)	(340,100)	
	Forests					
	Bottomland hardwoods		970,000	780,000	190,000	
	Other Forests		1,025	25	1,000	
	Pasture		0	0	0	
	Urban		31,300	1,300	30,000	
	Other		160,300	41,200	119,100	
	Total Water, All Components	Acres	(125,000)	(125,000)	(0)	
	Large Water		123,960	123,960	0	
	Small Water		1,040	1,040	0	

1/ 48 acres of land per mile (200-ft. strip along each bank) included in bottomland hardwoods category.
2/ 200-ft. strip along shorelines (24 acres per mile) included in bottomland hardwoods category.
3/ Includes acres of water surface area and/or land area along shore.
4/ Gross and net needs equal 115 acres per mile, based on 200-ft. strip along shore, with additional allowance for erosion averaging 15 ft. per mile per year.
5/ Classified as other lands.
6/ Classified as forest land other than bottomland hardwood forest.